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The Steel Corporation

It would be unwise to enter upon a critical analysis of the report of the Commissioner of Corporations on the U. S. Steel Corporation in any hasty way. The affairs of that corporation are so huge and complex that a valuation of its assets and business is a task that no engineer would care to undertake without the allowance of ample time and the provision of ample means.

The recent report of the Bureau of Corporations has been the result of such expenditure of time and means, and consequently is not lightly to be criticized. In fact, the impression that Mr. Smith's report makes upon us is that of a thorough and expert examination and study, conducted in a conservative way and summarized with scientific moderation. It is very far from being the violent attack upon the Steel Corporation that some of the "trust busters" had hinted it would be.

Mr. Smith does not present us with any new facts. It was hardly to be expected that he would do so, inasmuch as the Steel Corporation itself, by its admirable policy of publicity, has already stated the essential facts. Nor does Mr. Smith give us any very important new ideas. He finds that, upon its organization, the Steel Corporation was immensely overcapitalized, but that by its policy of reinvesting earnings, the present excess of capitalization over tangible property is very much reduced. Both of these things have always been well known and have been reckoned by the Stock Exchange in cutting down the market valuation of the stock.

J. R. Finlay analyzing the position of the Steel Corporation two years ago, in his treatise on "The Cost of Mining" reckoned the actual capital invested in the business of the Steel Corporation to be $1,068,000,000. Deducting preferred stock and bonded indebtedness, amounting to $958,000,000, the common stock represented the equivalent of $110,000,000 of invested capital, plus all of the enhancement in the value of the property, "a state of affairs," he said, "with which the stockholders should be satisfied."

The matter in Mr. Smith's report over which there will be most dispute pertains to the valuation of the iron-ore resources of the corporation. Mr. Smith reckons these at $90,000,000, but allows $100,000,000, a sum that is very much less than is estimated by the company itself. The estimation of these resources is extremely difficult, and no two experts would ever agree about them. Mr. Finlay estimated that the mining plants and cost of development of the ore resources represented $50,000,000. Having in view that figure, which does not count anything for the ore itself, we are of the opinion that Mr. Smith is too low in his estimate for this item, and that its actual value is somewhere between his figure and that of the company.

That portion of Mr. Smith's report, in which he takes up the established fact that the Steel Corporation has been able to earn a 12 per cent. profit on its whole investment, which investment represents about 50 per cent. of the total iron and steel business of the United States, introduces questions of industrial economics, whereof the discussion may be well postponed to another time. The matter is doubtless one that involves the public interest in many ways. In the meanwhile it is generally recognized that the report of the Commissioner of Corporations affords no ground for any action against the Steel Corporation as a combination in restraint of trade or a violater of the Sherman law.

Cost of Production

The recent remarks of the Hon. William C. Redfield, in the House of Representatives, are noteworthy for their excellent sense and their expert character, the like of which the Solons of Congress are not often able to hear. Whether they can profit from the pearls cast before them is another matter.

Mr. Redfield riddles the time-honored fallacy that the rate of wages paid to labor is a determining factor in the cost of production. He showed that cheap labor is dear labor, which, of course, is well known to every mining man who has had experience in operating in semi-civilized and uncivilized countries, and pointed out that the labor cost for manufacturing locomotives in Japan is three and a half times higher than in America, although the scale of wages is only one-fifth as much.

Mr. Redfield also demolished the chimerical fancy that the average cost of production of any article or substance in several countries can be determined by the investigations of a commission. "There is no fixed difference in cost between foreign and domestic producers," he said: "There is not, and there never can be, such a thing as fixity of cost. To attain fixity of cost in a factory is industrial tuberculosis, and means death. The difference between three domestic concerns in labor cost may be as great, or even greater, than the difference between foreign and domestic concerns in the same line."

The above enunciation of principles is, of course, nothing but common sense, and the principles themselves are well known to every expert.

Scientific Management

Scientific management in one phase or another seems destined to work its way into mining operations. It is already being investigated and, to some extent, being put in operation in some of the Lake Superior iron and copper mines; but, while it is possible to apply scientific management with profit to many phases of our mining operations, it may not be lightly ordered or carelessly put in force. It is quite likely that some companies will consider it economy to employ the best engineers obtainable to develop superior methods at their properties, but others are likely to be less far-sighted and may exercise false economy in the selection of the cheapest men available, thinking it a matter of subsidiary importance. To be successful, "scientific management" must be applied "scientifically." Aside from the possible economies of management, it means the breaking up of old-time habits among workmen, and unless this be done skillfully and in a politic manner, it may arouse opposition that will nullify all the benefits of the plan.

Copper Refinery Transportation

In visiting the copper refineries of the of the Atlantic seaboard, one point which immediately strikes the visitor is the diversity in transportation systems in this single specialized industry. The American Smelting and Refining Company, at Maurer, N. J., uses a mere skeleton of a truck, for man-power only, of which the body consists of two rails or tee irons turned up at each end. The Nichols Copper Company uses a rather larger car with a flat frame-work top made of channels, as does the U. S. Metals Refining Company, the latter's, however, being larger and heavier, while steam and electric locomotives are used for power. The Baltimore Copper Works and Raritan use large eight-wheeled cars, the former having horses and steam locomotives, the latter steam locomtives only, but of greater power.

On examining these differences it seems that they are not solely a case of *quot homines, tot sententiae,* but are dictated by the needs of the case, and that the transportation systems of these copper works might well form an instruction book on the selection of an industrial railway system. The Maurer plant is laid out in great measure for broad-gage railroad transportation, and as much traffic as possible is so handled. Of the inter-works freight, much is in lead bars, where a small bulk makes a large weight, and to have a large car would be wasted weight and space.

In the Nichols works, undoubtedly the small size of the anodes and cathodes has been the contributing cause to the small cars in use, for although the plant is well laid out for broad-gage "spotting," the size of the output renders the works large. With the U. S. Metals Refining Company, the cars would be perhaps better adopted to its small beginnings, as the De Lamar plant, than to its present size, were it not for the peculiar facility with which they can be stacked and handled by overhead crane in departmental work, and the fact that the long haul is from the smeltery to the refinery, while the two divisions are compact in themselves.

When we consider the scale of operations of the Raritan plant, and the magnificent distances (as well as size) of the Baltimore works, it is not strange that we are reminded of the equipment of a freight-handling, broad-gage railway.

Sintering Iron Ore

The Dwight & Lloyd roasting machine, which has already attained a wide application for desulphurizing and sintering in lead and copper smelting, is now to be introduced into the metallurgy of iron as a sintering device, for which purpose it will come into competition with the nodulizing kilns that are at present employed. The troubles of the iron-furnace men arising from very fine ores are well known. One of the devices for obviating them is nodulizing, which at considerable expense enables the fine particles of ore to be agglomerated to some extent. The experimental work, conducted on a fairly large scale, indicates that this agglomeration can be effected more cheaply and far more satisfactorily by the Dwight & Lloyd method. Iron masters who have had an opportunity to study the matter are, indeed, enthusiastic over the prospect. The actual result of the plant that is soon to be erected in Pennsylvania will be awaited with great interest.

The two forms of metalliferous alluvial deposits that are of great commercial importance are those of gold and tin. The application of dredging for the recovery of gold from some classes of such deposits was quickly followed by a similar application for the recovery of tin, but dredging for tin has not become a widespread practice, chiefly because alluvial occurrences of that metal are less common than of gold. Dredging for tin has heretofore been confined substantially to some of the Australian colonies, although attempts to introduce the process have been made at certain places in the Malay peninsula. This makes it of interest to report the boom in dredging for alluvial tin that is going on in both east and west Cornwall, where some powerful dredges are now at work. It is furthermore interesting to report that a dredge is now being constructed in California for erection in Alaska, where an attempt to work certain alluvial deposits in this way is soon to be inaugurated.

Correspondence and Discussion

Rand Drill Steel and Bits

In the JOURNAL of April 29, E. M. Weston describes a set of drill bits that have been satisfactorily tested at the Robinson Deep mine. The set consists of a short cross-bit starter and three long straight-edge or bull bits. In drilling banket ore many shapes of bits quite widely used in the United States rapidly lose gage, but with well made bits there are many shapes that would appear to me to be far better suited for service in the Rand mines than the bull bits. For many years the bull bit was the most satisfactory shape in use in the mines of the Joplin district; they alone stood up to service in drilling flinty ground, but, as machine drill sharpeners were introduced, certain forms of cross bits gave better results. The bull bits have been found difficult to spot, are apt to cause rifling, lose gage rapidly, and with air-hammer drills are hard to rotate.

The pointed bull bit in which the center of the cutting edge is a little in advance of the extremities spots easily, drills a round hole, is easily rotated, but loses gage almost as rapidly as the straight bull. With cross bits the concave or convex cutting edges are usually more satisfactory than the flat. The flat cross bit is hard to spot, the hole is apt to be rifled, and while it holds its gage well, it is difficult to rotate.

The concave bit cuts the outer rim of the hole in advance of the center and usually gives a free cutting hole. The gage is fairly durable, but the rotation is difficult. The most satisfactory cross bit is that with slightly convex cutting edges, as it not only drills in most rocks as rapidly as the concave bit, but is easy to start, rifles but little, is easily rotated and holds its gage.

In selecting the shape of bits, the length of the wings should receive proper consideration. It has been determined in practice that for drilling hard rock longer wings are more capable of withstanding the blow than short ones; but with long wings there is less clearance and it is more difficult to rotate the bit. The question of the proper shape of bit must be settled for each particular case. Whether the bits will be hand or machine sharpened will be an important factor in making the selection, for the most efficient bits must be accurately made, far more accurately than can be done by hand.

It has been my experience that after the best shape, angle of cutting edges and other such details have been determined for a particular case, it will be found that in order to get the best results from that bit, machine sharpening will be absolutely necessary to supply the drills with an abundant supply of sharp steel and that, without such a liberal supply, drilling cannot be done at a minimum cost.

It may be that the drills described by Mr. Weston are best adapted to conditions prevailing on the Rand, but I believe some form of cross bit will shortly be found to fulfil the conditions much more satisfactorily.

DRILL SHARPENER.

Joplin, Mo., June 28, 1911.

Views, Suggestions and Experiences of Readers

Sampling Ores from Cobalt Mines

In Mr. Pugsley's reply, in the JOURNAL of July 1, to my comment on his Cobalt-ore sampling methods, there are certain points which I think are by no means satisfactorily covered by him.

In regard to his comparison of mechanical and floor sampling he seems to infer that because his two floor samples checked each other, and did not check the mill sample, that the mill sample must have been wrong, which is a *non sequitur*. It is obvious that the same error might have been repeated in both floor samplings. As a matter of fact, in my own experience I have seen a lot of Cobalt ore sampled twice by hand, and twice by mill, the two hand samples checked and so did the two mill samples, but the pairs did not check one another.

In this case the mill sampling was not performed as Mr. Pugsley sugests, by splitting a small sample, but by putting the entire lot back through the mill. My own data entirely confirm Mr. Pugsley's view that hand and mill samples will not check, as a rule, on the same lot of ore, but my deduction from this fact differs from his.

In general, the views which were advanced by Mr. Mandy (or Lewis T. Wright, I have forgotten which) about two years ago seem remarkably sound. These were: That hand sampling, unless mechanically perfect, was an actual discriminative handling of the ore by an interested party; and that hand sampling only became good as it approached mechanical perfection, in which case, why not the machine at once?

I can see that the ordinary commercial sampling is not fitted to handle rich Cobalt ores, because of the risk of salting, but this is a matter quite apart from accuracy of the sample itself.

A. A. NASON.

New York, July 3, 1911.

The Hunt & Douglas Copper Process

I read with interest in the JOURNAL of June 10, Mr. Canby's account of the Hunt & Douglas copper process, and the reasons given for discontinuing its use at the Kansas City smelting works. I understood from Mr. Meyer, as Mr. Canby explains, that every difficulty which presented itself during the early stages of the operations with our wet method had been overcome except the loss of copper in reducing the suboxide to metal in the cupola furnace. They attributed this, undoubtedly with reason, to the difficulty of extracting the last trace of calcium chloride from the cakes of copper suboxide. I thereupon made some experiments upon a large scale, looking to the reduction of the cuprous chloride by electrolysis. I found that about half the chlorine passed into the electrolyte, and about half passed off as some gaseous compound, which, however, was easily condensed, making a much more active solvent than that produced in the regenerating towers. The amount of current necessary was somewhat above the theoretical requirement for a cuprous, but far below that necessary for a cupric salt.

I understood, however, that a rise in the price of sulphate made the conversion of copper into bluestone more profitable than the manufacture of metallic copper, and that Mr. Hoffman ingeniously used the sulphurous-acid towers for purifying the sulphate of copper liquors by the injection of air instead of sulphur dioxide.

Therefore no attempts were made at the Kansas City works to apply my patent No. 664,537, of date 1900. The claims which I made were as follows: (1) For the process of reducing copper ore and matte, which consists in electrolyzing solid cuprous chloride, and employing the gases evolved in the treatment of copper ore and matte.

(2) The process of reducing copper ore and matte, which consists in electrolyzing solid cuprous chloride, employing the gases evolved in the treatment of copper ore and matte, employing the electrolyte resulting from the electrolyzing of the solid cuprous chloride as a solvent for the cuprous chloride so produced, and recovering the copper from the solution by electrolysis. JAMES DOUGLAS.

New York, June 27, 1911.

May Operations at Goldfield Consolidated

During May, 1911, the total production of the Goldfield Consolidated Mines Company was 29,450 tons, containing $962,110, or an average of $32.67 per ton, of which 29,410 tons were milled with an average extraction of 94.51 per cent. and 40 tons were shipped of an average value of $54.56 per ton; the net recovery from all ore being $30.89 per ton. The total net profit was $679,537 or $23.07 per ton.

MAY OPERATING COSTS AT GOLDFIELD CONSOLIDATED

Mining:		
Development	$1.17	
Stoping	2.17	
		$3.34
Transportation		0.08
Milling		2.26
Marketing		1.13
General expense		0.62
Bullion tax		0.39
Marketing ore shipped		0.01
Construction		0.04
Total cost of operation		$7.87

During the month 4585 ft. of development work was done. At the Clermont mine the 413 intermediate drift between the 600- and 700-ft. levels was advanced about 75 ft. and produced 682 tons of ore that averaged $125 per ton. The raise through the 604 orebody on the 1000-ft. level was connected with the 900-ft. level, and a stope was started on the 900 which has produced 150 tons of $50 ore. The raise from the 1200 was connected with a winze from the 1000-ft. level, the greater part of the winze being in ore of milling grade. The raise, however, encountered no ore of value. Intermediate drifts are being driven from the bottom of the winze, about 120 ft. on the incline from the 1000-ft. level.

At the Combination mine the drift on the second level was extended 50 ft. west through ore that averaged $60. This will connect with the 136 stope, making an orebody over 100 ft. long. At the Mohawk mine the 354 sill floor was extended, and produced 1647 tons of ore that averaged $30 per ton.

Chronology of Mining for June, 1911

June 1—Fire burns bunk and boarding house at Nevada Consolidated; loss, $100,000.

June 15—First payment on Hidden Creek mine, British Columbia, made by Granby company.

June 20—Reopening of the St. Louis mine in the Lake Superior copper country started by Calumet & Hecla Company.

June 21—Dissolution of the E. I. du Pont de Nemours Powder Company ordered on account of alleged violation of the Sherman anti-trust act.

June 26—Denial of injunction asked by G. M. Hyams against proposed Calumet & Hecla merger.

June 26—Cunningham coal claims cancelled by the General Land Office.

June 27—Report of Bureau of Corporations on results of its investigation of the "steel trust," referred to President Taft.

June 28—Dismissal of suit brought by minority stockholders against Greene Consolidated Copper Company, the Greene-Cananea Copper Company and their officers and directors.

June 29—Eighty-four wire officials and employees indicted for alleged illegal restraint of trade.

June Dividends

The accompanying table shows the amount per share and total amount of the dividends paid during June, 1911, by a number of mining and industrial companies in the United States, Canada and Mexico.

United States Mining Companies	Situation	Per Share	Total
Bing'm-NewHav'n,c.,s.l.	Utah	$0.20	$44,137
Butte Coalition, c.	Mont.	0.25	250,000
Bunker Hill & Sull., l.s.	Ida.	0.20	65,400
Calumet & Arizona, c.	Ariz.	1.00	650,000
Calumet & Hecla, c.	Mich.	6.00	600,000
Elkton Con., g.	Colo.	0.01½	37,500
El Paso, g.	Colo.	0.01	24,500
Golden Cycle, g.	Colo.	0.03	30,000
Hecla, l.s.	Ida.	0.02	20,000
Federal, l.s.	Ida.	1.75	210,000
Homestake, g.	S.D.	0.50	109,200
Iowa, g.	Colo.	0.00½	8,333
Klar-Piquett, z.	Wis.	0.25	5,000
Mary McKinney, g.	Colo.	0.01	13,093
Nevada Consolidated, c	Nev.	0.37½	431,700
North Star Mines, g.	Cal.	0.30	75,000
Quincy, c.	Mich.	1.00	110,000
Uncle Sam, g.s.l.	Utah	0.05	25,000
Wasp No. 2, g.	S.Dak.	0.01	1,479
Yukon Gold, g.	Alas.	0.10	350,000

Coal, Iron, Industrial and Holding Companies	Situation	Per Share	Total
Am. Sm. Sec., pfd. A.	U. S. Mex.	$1.25	$255,000
Am. Sm. Sec., pfd. B.	U. S. Mex.	1.25	275,000
Crucible Steel	U. S.	1.75	427,638
General Chem., com.	U. S.	1.50	122,269
International Nick.,com.	U. S. Can.	2.50	222,816
Interna. Sm. & Ref.	U. S.	2.00	200,000
National Lead Co., pfd.	U. S.	1.75	426,433
National Lead Co., com.	U. S.	0.75	154,914
Phelps, Dodge & Co.	U. S. Mex.	2.50	1,123,465
Standard Oil	U. S.	9.00	8,730,000
Texas & Pacific Coal	Tex.	1.50	37,500
U. S. Steel, com.	U. S.	1.25	6,353,781

Canadian, Mexican and Central American Companies	Situation	Per Share	Total
B. C. Copper, c.	B. C.	$0.12½	$73,964
Crown Reserve, s.	Ont.	0.05	88,441
Hadley Gold, g.	B. C.	0.50	60,000
Kerr Lake, s.	Ont.	0.50	300,000
Rio Plata, s.	Mex.	0.10	37,343
San Toy, s.	Mex.	0.01	60,000

Blende Roasting

E. Prost reports (*Bull*, Soc. Chim. Belg., 1911, XXV, 103—115) that in a series of experiments on the roasting of blendes, to which known proportions of lime were added, it was found that in all cases there was an increased retention of sulphur, corresponding almost with the lime used, and further addition to the charge of silica, lead oxide, or iron oxide had no appreciable effect in bringing about the decomposition of the calcium sulphate produced. Furnace experiments confirm those carried out in the laboratory and indicate that nearly all the calcium present in the charge must appear as sulphate after roasting.

Zinc in St. Lawrence County, New York

SPECIAL CORRESPONDENCE

Exploration of the blende occurrences in the Edwards district, St. Lawrence county, New York, is again under way, with assurance that the work will be pushed until decisive results are obtained. As may be recalled, the district received some attention five or six years ago, but unfortunately, legal difficulties which arose at that time led to a suspension of activity just at the critical stage, leaving unsettled the question of the real significance of the discoveries. The exploratory work which began this spring is being conducted by the Northern Ore Company, with A. L. Moore in charge at Edwards. The leading interest in the company is held by the firm of Pilling & Crane, of Philadelphia. The company owns the mineral rights on most of the lands along the belt that includes the principal blende outcrops.

Ore Associated with Limestone

The ore is associated with crystalline limestones of Pre-cambrian age and the discoveries that have been made thus far are situated in a belt of these limestones about 10 miles long and a mile or more wide, which extends across the towns of Fowler and Edwards, south and east of Gouverneur. This limestone area is at present the center of extensive mining operations in connection with fibrous talc; in fact, all of that article for which St. Lawrence county is noted is obtained from beds within its limits. There appears to be a close relation between the distribution of the two minerals, which may have some genetic significance not yet apparent.

Previous Work Done

In the earlier period of operations the most interesting development was near Edwards on the northern end of the belt. Several openings were made in a ridge of limestone that crosses the highway from the village of Edwards to Trout lake, about ½ mile from the former place. The openings covered a distance in all of about 1500 ft., but were not continuous. At one point a band or vein of blende with some pyrite was uncovered and followed to a depth of 5 ft., showing a solid orebody, about 5 ft. thick, all the way. Open cuts at other points revealed bands and scattered bunches of ore with a thickness, in places, up to 15 ft. The prospects, how-

ever, were not sufficient to form a basis for any valuable estimate of the continuity or size of the deposits, although they could only be considered as favorable, so far as they went. The ore that was taken out during the operations was exceptionally rich, running from 8 to 10 per cent. up to 45 per cent. in zinc. Pyrite was the principal metallic associate of the blende and the gangue consisted of limestone and serpenitne.

The recent work has centered thus far upon the Edwards occurrence. A prospect shaft has now reached a depth of 100 ft. and demonstrated the continuity of the ore to the bottom. About 500 tons of ore, averaging probably over 35 per cent. zinc, have been taken from this opening. The work is being carried on by two shifts and about 1 ft. per day is made in the shaft. The vein averages from 5 to 7 ft. thick and has a dip of 45 degrees.

It is the intention of the company to begin work soon on the Balmat property, near Sylvia lake, on the southern end of the belt and about eight miles from Edwards. The showing at this place is said to be as good if not better than at Edwards, although the openings that were made in earlier years are now inaccessible, so that there is little evidence bearing on that point. The ore from Balmat carries considerable galena and more pyrite than that from Edwards. There are several places where ore has been uncovered in the interval between the two places mentioned, and it will require some time before the possibilities of the district as a zinc producer can be estimated. The recent press reports to the effect that a concentrating plant is to be built immediately at Edwards have no foundation in fact. There is a fair prospect, however, that the district will soon be a small shipper of zinc ore.

A New Solder in Paste Form

A new solder in paste form, designed to supplement the old-fashioned soldering iron, solder stick, flux, etc., has been recently placed on the market by the Johns-Manville Company, 100 John street, New York. It is in the form of a paste in a collapsible tube, and all that is necessary for its effective use is to scrape off the surface a little with a knife, squeeze some of the soldering paste on and apply a match, candle or torch. When the paste becomes hot it fuses and solders in the same manner as the old-style soldering stick. For an emergency measure, the solder has many advantages.

The Wood Drill Works, of Paterson, N. J., is now using vanadium-tungsten iron in the principal wearing parts of its drills, namely, the cylinder, chest and air head, in order to give them increased strength and longer life.

Cost of Production

Hon. William C. Redfield, of Brooklyn, a manufacturer who does not believe in high protective duties, in a recent speech before the House of Representatives, maintained that cheap labor is dear labor, and that goods can be manufactured as cheaply in the United States as they can in Europe or in the Orient, where wages are much lower. Moreover, he maintained that it was impossible for any tariff board or Congressional committee to ascertain the actual American cost of production or foreign cost of production. The Brooklyn member began in this way:

" In 1908 there appeared certain sacred words, familiar to this House, which at the beginning of what I have to say I desire to read as the text of my remarks. These words are:

"'In all tariff legislation, the true principle of protection is best maintained by the imposition of such duties as will equal the difference between the cost of production at home and abroad, together with a reasonable profit to American industries.'

"It is a great pity that these words were printed only in the English language. It is a great pity they were not translated into Japanese, that they might adorn the cabs of the 720 American locomotives on the Japanese railways for the benefit of the Japanese engine-drivers. It is a great pity they were not translater into Chinese, that those in Manchuria, who are wearing American cottons, might know how self-sacrificing the makers were in selling them to them. It is a great pity that they were not translated into Javanese, that the machinery my own house has sent to the Dutch East Indies might tell to the Malays there how beneficent a factor we have been to them. It is a great pity they were not translated into Hindu, that the stokers of of Calcutta electric-light works might know how generous was the American firm that sold them their forced-draft plant.

"It is a great pity they were not published in Melbourne, that my acquaintance there, who bought half a million dollars' worth of American hardware between New York and San Francisco for sale in Australia, might know how kind those American manufacturers were to him. It is a great pity they were not printed in Dutch or German, that my former customers in Antwerp and in Berlin and Düsseldorf might know my generosity. . . . .

Underselling Foreign Manufacturers

"How does it happen that in a quotation recently made for machinery to a mine in Japan the American price was $125 less than the English price? How does it happen that these American locomotives are running upon the Japanese railways, upon those of Formosa, upon those of Manchuria? How does it happen that American engines are sold in Hongkong? How does it happen that I sent one day before yesterday to Rangoon? These are sold in open competition with the makers in Great Britain. I happen to know what those locomotives cost, relative to those made by German and English manufacturers, and I happen also to know this, which is one of several stories which will illustrate this particular contention, namely, that last January I was in the city of Tokio, and a friend who was with me took a large contract, by the way, from the Japanese Imperial State Railways, in open competition with Germany and England, for several million dollars' worth of locomotives.

Labor Cost Higher in Japan

"That gentleman went to the head of the locomotive shops of the Imperial Railways, and the Japanese master mechanic said to him: 'We can make locomotives much cheaper than you can in America. We have American equipment, and we can produce them for less than you can.' 'Can you?' inquired my friend. 'If so, let us get at the facts. If you will tell me from your cost sheets precisely what your locomotives cost, I will tell you what ours cost. And, by the way,' he said, 'what makes you think that your locomotives cost less than ours?' 'Why,' he said, 'because we only pay one-fifth the wages to our men that you pay to yours.'

"So they got out the cost books, and they found that the fact was that the labor cost for locomotives on the same specifications was 3½ times greater in the Japanese shop than in the American shops. And that is a perfectly normal fact, and not an abnormal one. . . .

"There is no fixed difference in cost between foreign and domestic producers. There is not, and there never can be, such a thing as fixity of cost. To attain fixity of cost in a factory is industrial tuberculosis, and means death.

"The difference between three domestic concerns in labor cost may be as great, or even greater, than the difference between foreign and domestic concerns in the same line. The attempt to adjust a tariff rate to cover such a difference is, therefore, absurd. If it provides for the difference in the cost of foreign goods and of American goods made in an American factory where those goods are expensively made, it would prove an enormous bonus for an American manufacturer who made his goods economically. If it provides for the difference between foreign cost and American cost for goods made in the most efficient American mill, it will not protect at all the American maker whose cost is high. You may have an injustice done one American manufacturer or an enormous profit paid to another, and you cannot

avoid it. It is in the nature of things. No law can get at it. And if your proposed duty provides for the average foreign cost—an impossible thing to learn—it does not provide, therefore, for the skillful and economical exceptions among foreign manufacturers.

"There is no way known to me—and I may say it has been my duty to strive for years to find out—there is no way know to me to get at the real cost of producing a thing in Germany, France, or any other foreign country. When, if ever, was there a man who could suggest a method whereby you could inquire into the business of a foreign concern, or whereby these facts concerning the inner details of its operation could be brought to light in this country? It is a perfectly absurd thing on its face, and I say it cannot be done."

Chinese Mines and Mining

The four provinces of Kwangtung, Kwangsi, Kweichow and Yunnan, constituting the consular district of Canton, possess mineral resources of great variety and richness, according to Consul General Bergholz, of Canton. Gold has been washed for centuries from the waters of Hainan. Silver mines are found in all four provinces, and are being worked at Pakshiktong, Kwangtung, and in Kwei Hsien, Kwangsi, along semiforeign lines. The most important deposits that have been tapped to any extent in this district are the stanniferous lodes at Kochiu, in Mengtsz Hsien, Yunnan, and at Hiutsongling, in Tamchow, Hainan. At Kochiu alone has any considerable advance been made toward modern scientific mining. Iron, coal, copper, antimony, orpiment, lead and quicksilver are found in various sections of the district.

Government Restrictions

Mining in China has been handicapped by fees, royalties and export charges, etc., imposed upon mines by the central government. Mines are not to be opened until there has been obtained from the board of commerce a permit to prospect and a permit to operate. Mining concessions must not be over 33 square miles in area and the length may not be more than four times the width. Should there be graves upon the land included in the concession care must be taken in sinking shafts to avoid them, and when such avoidance is absolutely impossible a liberal allowance must be made for removing the graves. The permit to prospect allows merely an examination of the surface outcrop of the vein, and such examination "must not be carried to too great a depth or over too great an extent of ground." Foreign capital may be admitted only to equal shares with Chinese capital in any original mining enterprise.

Should a company consisting solely of Chinese capital find its funds too limited to conduct the undertaking properly, it may raise a foreign loan upon the security of its machinery and plant, but it cannot mortgage the mine for this purpose. The ordinary land tax must be paid on all private land affected by a permit to prospect. Public lands affected by such a permit shall pay an annual rental of $3.35 per acre. The fee for a permit to prospect is established at $33.50 and before prospecting may begin one year's rental on all government land thereby affected must be paid. The fee for a permit to work a mine is established at $67 for any area of 10 square li or less, and for every additional square li, $6.70 (li = ⅓ mile). A tax must be paid on the gross output of all mines as follows; (1) Coal, antimony, iron, alum and borax, 5 per cent. ad valorem; (2) petroleum, copper, tin, lead, sulphur and cinnabar, 7½ per cent.; (3) gold, platinum, silver, mercury and zinc, 10 per cent.; (4) quartz crystal and all sorts of precious stones, 20 per cent. Export duty must be paid on all ore or minerals exported, according to the customs regulations. Upon receipt of a permit to prospect, a bond of $3350 must be filed, and on receipt of a permit to work a bond of $6700 is required by the authorities.

Native Mining Enterprises

In 1908 the Singapore Merchants Pioneer Company, organized by wealthy Penang Chinese and capitalized at about $500,000, was granted the sole right to develop the mineral resources of Hainan and has opened a tin mine at Hiutsongling, in Tamchow, the ore of which is claimed to clean up 60 per cent. tin. Foreign machinery will be employed to some extent in this undertaking. Another Chinese company is working the Pakshiktong silver mines in eastern Kwangtung, the main lode of which has been reached at a depth of about 60 ft. and is said to be 1½ in. in width. It is claimed for the ore that 70 per cent. of lead and 50 to 60 oz. of silver per ton can be secured.

Several attempts have been made by Chinese companies to work the silver mines of Kwei Hsien, Kwangsi, but with no success. Ten years ago a syndicate started work in this district, but soon abandoned it when the cost of operating the mines was found to be twice the gross receipts therefrom, and, subsequently, a second syndicate was organized to carry on the work, but was dissolved upon the untimely demise in Canton of its promoter. More recently a third Chinese company sunk $200,000 in the mines in seven months and then gave up the undertaking. The mines have been examined by a native mining engineer, educated in the United States, who reports that in the section examined by him there are no less than 20 silver veins and smaller deposits of gold, copper and lead.

There are also in Kwangsi deposits of coal, antimony and tin, worked by the natives on a small scale and by primitive methods. Much of the coal is of superior quality and some of it has found its way to the Canton market. The tin mined in Kwangsi is crudely smelted on the spot and sent down to Wuchow for export as tin slabs. A few years ago the high price which antimony reached on the Hong-Kong market prompted the merchants of Wuchow to install an antimony smeltery at that place, but as the price of antimony dropped soon after to normal figures, the smeltery has since remained idle. Quicksilver mining has been attempted in Kweichow by an Anglo-French syndicate, but with no success. Coal is found throughout Kwangtung proper and in the island of Hainan, but is worked only by native methods and on a small scale. It is of indifferent quality and scarcely figures as an article of commercial importance. The tin mines of Kochiu in Yunnan are exceptional, as they are operated by advanced methods[1].

Auriferous Antimony Ore Treatment

A recent process for the treatment of gold-bearing antimony ores is that of John Jones and H. S. Bohn, of Mount Morgan, Australia (U. S. Pat. 984,090). According to their scheme, the ore is treated with a solution of hydrochloric acid generated by the action of sulphuric acid on salt, with simultaneous heating and agitation. The solution thus obtained is drawn off and treated with chlorine to destroy any retained sulphuretted hydrogen, and the resulting solution, after removing the suspended impurities, is electrolyzed for antimony. The greater part of the sulphuretted hydrogen expelled from the ore is drawn off into a gasometer and treated with chlorine evolved in the electrolysis, thereby regenerating hydrochloric acid, and precipitating sulphur. The residue from the hydrochloric-acid leaching is treated for its gold content.

Costs at Blue Bell Mine, B. C.

The costs of mining and ore treatment at the Blue Bell mine, Kootenay lake, B. C., were the subject of an interesting paper by S. S. Fowler before the Western branch of the Canadian Mining Institute. A summary of the figures, which include all charges except interest and sinking fund, shows that in the treatment of 43,069 tons of ore—containing lead, iron and zinc—during nine months prior to March 31, 1910, the cost of ore extraction was 98.4c.; concentration, including weighing of ore and loading of product, 50.2c.; management and all general expenses, 37.6c.; total, $1.862 per ton. These costs were attainable only through unusually favorable physical conditions.

[1] *Daily Consular and Trade Reports*, April 1, 1911.

Details of Practical Mining

This department is designed to treat in a brief way of details of everyday practice. Many readers are doing interesting things in mining and milling that other readers like to know about. The thought that there is nothing new in them should not be a deterrent of telling about them. Something that is an old story in one district may be quite unknown in another. Our draftsmen can develop any kind of a pencil sketch that is intelligible. A blueprint answers all the purposes of the engraver. Contributions are solicited.

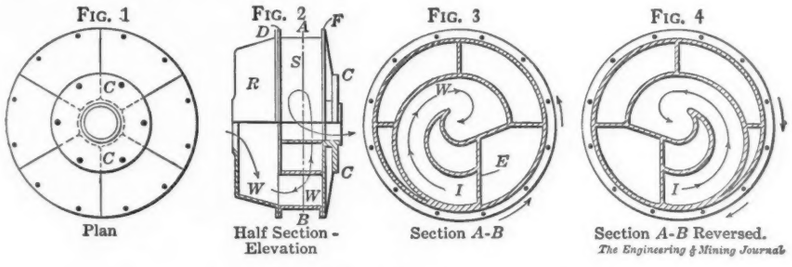
Notes of Interest to Prospectors and Operators of Small as well as Large Mines Things that have to be done in Everyday Mining

Feeder for Tube Mill

BY H. SHARPLEY*

The feeding device for tube mills, shown in the accompanying illustration, is so made that it can be reversed by changing the manner of bolting the parts together. The advantages of such a feeder are that it is a simple matter to make the change when it becomes necessary to reverse the direction of drive; it is made in sections that may be readily renewed; pebbles, once in the lifting chamber *L* cannot fall back into *R*, the receiving chamber, and being "built up" is cheaper to construct than a solid casting. The feeder consists of five parts, *R* is the receiving chamber, *S* the lifting chamber, *C* the connecting flange, and *D* a division plate with inlet hole of suitable area, which area is governed by the sectional area of the trunnion of the mill. The plate *D* is bolted between *R* and *S*, as shown in Fig. 2, in such a position that *I* comes on the spiral side of the division at *E*, Fig. 3. At *F*, in Fig. 2, is shown a division plate, which is placed between *S* and *C*, and in which there is a hole corresponding in position and diameter with the inner diameter of the tube-mill trunnion.

To reverse the feed it is only necessary to loosen the bolts and change *S* from the position shown in Fig. 3 to that shown in Fig. 4, and tighten again the bolts that hold the parts together.



A REVERSIBLE TUBE-MILL FEEDER

*Superintendent, Blackwater mine, Waiuta, New Zealand.

Repairing Concrete Floors

There is a popular and wide-spread fallacy to the effect that a concrete floor once chipped or cracked is practically at the end of its usefulness. This is undoubtedly due to the result of unskilled workmen attempting to repair a damaged floor. Unless proper care is taken and the workman engaged on the job has sufficient knowledge of concrete, a repair job is most unsatisfactory.

When floors have been chipped in particular places because of some phase of the industry which gave rise to dropping heavy materials in one place, the proper method of repairing is to chip out with mallet and chisel a recess usually square, of sufficient depth to reach to the bottom of the deepest break in the concrete surface. The rough surface resulting from this process is then treated with acid to bring out the solid aggregate, or else a stiff brush is used to remove all the loose dust, and the recess washed out by sluicing with a hose. When all the dust particles have been removed the recess is grouted with cement and before this has set the granolithic finish applied and leveled with the rest of the floor.

Repairs made in this manner, according to the *Cement Age*, are just as permanent as the remainder of the floor, as the bond between the new and old concrete will be perfect if all the loose material has been carefully removed.

A Ten Stamp Mill of Novel Design

BY J. BOWIE WILSON*

The 10-stamp mill shown in sectional elevation in the accompanying illustration was erected at Sandstone, Western Australia, a town in the East Murchison goldfield, about 300 miles by rail due east from Geraldton a port on the West Australian coast about 300 miles north of Perth. At the time the plant was being erected the railway was 100 miles from Sandstone so all material had to be brought in by wagon.

The conditions prevailing at Sandstone, and throughout most of the West Australian goldfields, necessitate the erection of plants upon practically a level plain where there is no local timber suitable for building purposes. There is so little fall to the ground that it is necessary to lift tailings to the cyanide vats.

DESIGN OF CRUSHER AND OREBIN

When considering the general layout of the plant the idea of excavating the battery site and placing the mortar boxes below the level of the ground was suggested. After carefully going into details of costs this plan was adopted and the plant was erected and now has been running for over a year, giving complete satisfaction.

The mine had three shafts up any of which it might be advisable or necessary to raise ore. For this reason the rock breaker was placed close to the bins of the most important shaft and with the top of the breaker level with the ground. This necessitated the excavation of a pit for the rock breaker in order that any ore raised from either of the other shafts could be trucked along the surface and tipped directly to the breaker. If the breaker had been erected in the headframe of the main shaft or upon the surface of the ground it would have been necessary to make arrangements to elevate the ore.

The only disadvantage of this design was that by lowering the discharge of the breaker the hight to which the broken ore had to be elevated to the battery bins was increased. The broken ore from the breaker fell upon a belt conveyer which elevated it to the battery bin which was built at such a distance from the shaft as to allow the belt to rise to the required hight. The battery bin consists practically of a bottomless timber box placed directly upon the ground. It was built of timber posts, the bottom set in concrete and the tops braced across either with tie bolts or old hoisting rope.

*Consulting engineer, 82 Pitt street, Sydney, N. S. W.

Tie bolts were also put in at the base. Lining boards of 2-in. thickness were used on the sides. No bottom was placed in the bin but low-grade ore was first dumped in direct on the leveled surface to form a rock bottom at the ordinary angle of repose of the broken ore. The delivery end of the belt conveyer, elevating the ore from the rock breaker, was carried at such a hight above the middle of the bin that the broken ore heaped up in the middle of the bin and sloped away to the sides. This materially increased the capacity of the bin without adding to the cost of erection.

The building of the bin in this way, resting directly upon the ground, reduced the timber required for construction to a minimum, which was an item worth considering when all the timber had to come 200 miles by rail and 100 miles by road from the nearest port with no back loading to reduce freight. It also reduced the length of conveyer belt required as it reduced the hight to which the broken ore had to be elevated. The box form of bin, of course, necessitates a certain amount of ore remaining dead in the bin but then this can be looked upon as a reserve of ore on the surface to be used in case of accident in the mine to keep the plant running and even if it does require extra handling to get it into the battery, any manager running a small mine will appreciate that such a reserve of ore on the surface is an advantage and often useful.

The broken ore passed by gravity in the usual way into automatic ore feeders to the mortar boxes which rested upon the top of the mortar blocks, that were 11 ft. below the level of the ground. As will be seen by the section, below the copper plates the excavation was deepened another 6 ft. to allow for the installation of pans as the plant was designed to treat a large tonnage by coarse crushing in the mortar boxes followed by fine grinding in pans. Below the pans the pulp flowed to a sand lift which elevated it to the launder running to the settling dam.

The Battery Site

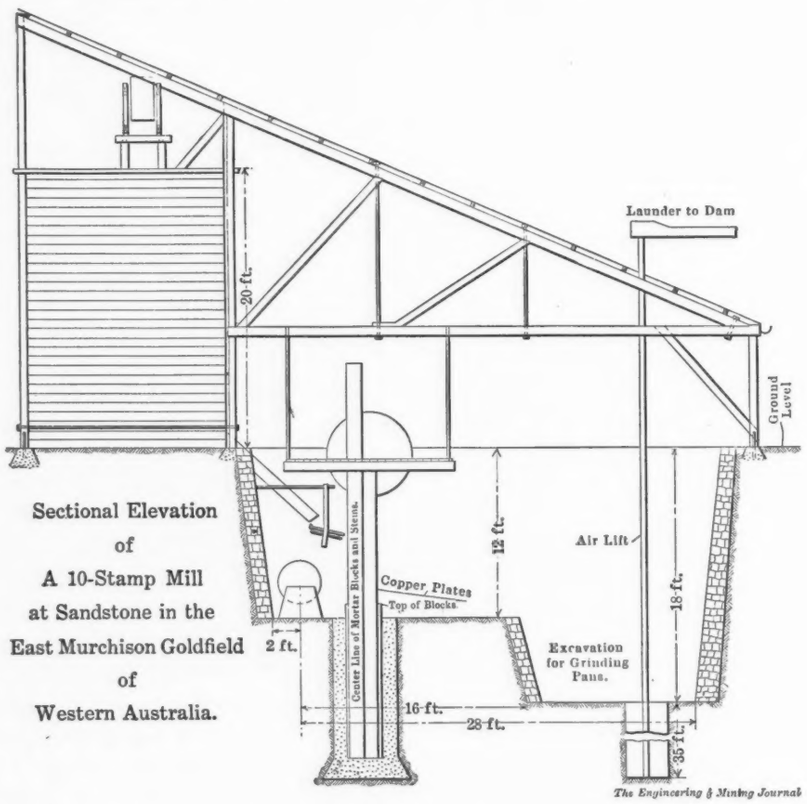
In making the excavation to contain the mortar blocks and grinding pans a ramp was cut, up which tip drays could be hauled. This was afterward used as a belt way for the drive from the battery engine which was placed upon the ground level to the rear and to one side of the ore bin. The material excavated could be used to slightly bank up the surface around the excavation to prevent it being flooded during rains and the remainder was useful in making dams to impound water and tailings as the whole of the water required for the plant had to come out of the mine and was reused after settling in dams.

As will be noticed from the plans this method of construction allows of a minimum of timber in the whole construction and it also makes a compact plant when erected. It also has the advantage that there is only one way into the battery and it is harder for anyone to pay a surreptitious visit to the plates for the purpose of seeing how the amalgam is getting on. In places where timber is scarce and expensive but the surface is easy to excavate, this design is worthy of consideration.

The chief drawbacks that can be advanced against this design, are the liability to flooding and the cost of raising the pulp an additional 18 ft. The first is more evident than real and if occasionally the excavation does become flooded there is nothing below the water that would be damaged as the driving machinery is not below ground. The second condition must depend upon individual circumstances when the cost of elevating the tailings the additional distance must be placed against the savings in the cost of erection. With many small plants it is frequently sound to knowingly slightly increase working expenses in order to reduce the original cost of erection.

Gas Power Used

The power to drive the battery and an air compressor for the mine was supplied by two National producer-gas engines. They were run upon "mulga" charcoal, mulga being a low growing scrub which covers the district. Producer-gas engines were installed to reduce the firewood bill as mulga, big enough for use in boilers was becoming scarce and had to be hauled long distances. Also all the water available came from the mine and carried a high percentage of solids which caused great trouble in the boilers and only allowed the use of the most simple and uneconomical types and even these had to receive a great deal of attention and repairs. The producer plant was erected and started by engineers who had never run this class of machinery but from the start it gave little trouble and has been highly successful.



Sectional Elevation of A 10-Stamp Mill at Sandstone in the East Murchison Goldfield of Western Australia.

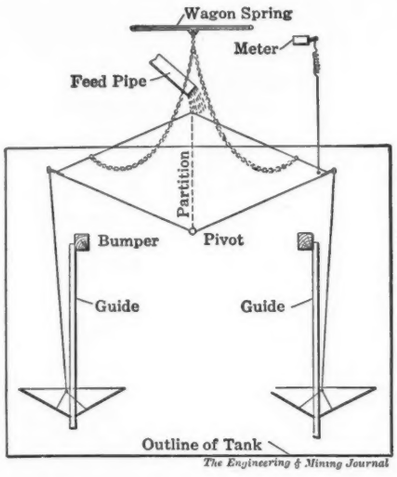
Mounting Blueprints

A satisfactory method for mounting blueprints to stand much handling, according to the *Aust. Min. and Eng. Rev.*, is make a frame of 3x1-in. pine, about the size of the average blueprint. Then, at a distance of about 3 in. apart and close to the edge of the frame, drive 1¼-in. nails through so that the points of the nails stand about ¼ in. above the surface. Then get a piece of cheesecloth or cheap calico, wet it, and stretch it tightly across these points. Then wet the print also, give it a coat of flour or starch paste, and lay it on the cloth. When it dries, if the job has been done properly, a perfectly flat print that is practically untearable will result.

A Simple Solution Meter

A meter for measuring cyanide solutions, as used at the Liberty Bell mill in the San Juan district of Colorado, is shown in the accompanying illustration, and is described by Charles A. Chase[1]. The mechanism is devised from the tilting-box tailing sampler.

The pans or pipe guides are always submerged, and steady the movement of the box, after the manner of dashpots. Since they are placed over the



A TIP-BUCKET SOLUTION METER

vats, any splash is accounted for in calibrating. Each filling of the tilting box is registered by the counter, as shown in the sketch, then knowing the capacity of the box a simple multiplication by the number recorded on the register gives the amount of solution flowing into the tank.

Coating Iron with Lead

To coat iron with a covering of lead which will be in absolute metallic contact, states the *Chemical Trades Journal*, is a difficult operation. Valves and small fittings made of iron well galvanized on the exterior may be homogeneously covered with lead in the workshop by any mechanic. The method consists in immersing the piece to be coated in water to which a few drops of sulphuric acid have been added. Then, while in the acid water, the piece is readily amalgamated in the usual way by squeezing mercury through close-woven cloth all over its surface and thoroughly rubbing it in. The excess mercury is rubbed off and the piece carefully dried without heat, and then immersed in a bath of lead, which should be well above its melting point, so that it would not tend to solidify by introduction of the cold piece. The casting may be withdrawn after about 20 seconds, and will be found to be homogeneously covered with lead. This method requires the piece to be galvanized before applying the lead, and the galvanizing must be in good condition, otherwise the subsequent amalgamation will be imperfect and present an unsightly appearance.

[1]"Notes on the Liberty Bell Mine," a paper to be read at the San Francisco meeting of the American Institute of Mining Engineers, in October, 1911.

Creosote and Zinc Chloride as a Wood Preservative

A recent development in wood preservative, which Walter Bühler[1] describes briefly, is that of the modified basic processes which are, with one exception, a combination of creosote and zinc chloride. The exception is the "Wellhouse" process, which is a combination of zinc chloride, tannin and glue.

There are three processes which use a mixture of zinc chloride and creosote as a preservative, namely, the Rutgers, Allerdyce and Card processes. In the Rutgers process these two liquids are injected in a mixed condition, the object being to maintain a uniform mixture by regulating the gravities of the two liquids so that one will remain practically suspended in the other. This method, while still in use to some extent abroad, has had but little success in the United States.

The Allerdyce process is a two-action process, the zinc chloride being injected first, and then the creosote oil. In the Card process, which is comparatively new, having only been patented in March, 1906, the creosote is injected under pressure, mixed with zinc chloride. This, of course, has the advantage over the Allerdyce process by reason of its being a one-movement process and, in addition, the oil is probably carried farther into the wood and is more evenly distributed.

These processes, undoubtedly, have considerable merit and will prove successful, providing the zinc chloride penetrates to the heart of the timber, and the creosote sufficiently deep to act as a plug to prevent the chloride from leaching out. The heart wood of certain timbers seems to resist penetration by zinc chloride. The main objection to the injection of zinc chloride alone is that the action is often only superficial, as stated above, and that the uses of timbers so treated are restricted, due to the fact that the chloride, being a soluble salt, soon leaches out. This objection is overcome if the leaching can be prevented, and to do this the creosote oil is injected.

There seems to be little question that this process is of more value than straight Burnettizing, but it is not claimed that it is as effective as straight creosoting. Its cost is slightly more than Burnettizing and slightly less than creosoting.

[1]*Proc.* A. S. C. E., Nov., 1910.

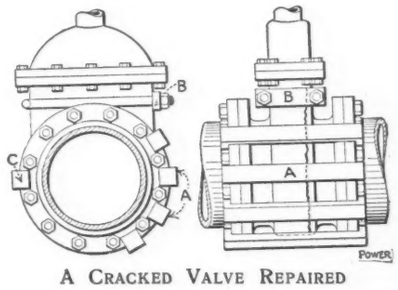
Operation of Gas Producers

The question of operating temperatures for gas producers has lately been investigated by the Bureau of Mines. It has been shown by the experimenters that at 1100 deg. C. only small quantities of steam can be completely decomposed by carbon, and that with large quantities of steam compared to the oxygen supplied a temperature of at least 1300 to 1400 deg. C. is required. It is, therefore, suggested that as high a temperature for the fuel bed should be attained as is possible without injury to the producer before admitting steam, then as the temperature of the bed goes down the steam should be gradually reduced and by the time the temperature has reached 1000 deg. C., the steam should be completely cut off.

[In actual practice, where the gas is used for gas-engine fuel, the above practice results in a supply of varying composition, giving the engineer constant trouble to keep the proper mixture. At certain plants using producer gas for internal-combustion engines it has been found advisable to keep the maximum quantity of steam passing through the fuel bed that can be maintained constantly, as giving best results for both engines and producers. Although great capacity is gained by running a producer hot, it is often cheaper to add to initial capital expenditure and pay depreciation and interest charges rather than repair bills. It is also to be noted that under the conditions noted above, the steady maximum flow of steam allowable, that clinkering greatly decreased, lessening labor charges.—EDITOR.]

A Temporary Valve Repair

An emergency repair job was recently made on an 8-in. gate valve that was in a water line and split, as shown in the accompanying illustration.



A CRACKED VALVE REPAIRED

To make the repair, W. E. Dean, in *Power*, states that the valve was drawn together by four ⅝x1½-in. iron clamps *A*, shrunk on as shown. A yoke piece was made to fit around the neck of the valve, the ends being threaded for nuts which held a cross piece *B* in place on the cracked side of the valve neck. The clamp *C* was used to hold against the other four clamps. This arrangement completely closed the crack.

The Report on the Steel Corporation

The report of Herbert Knox Smith, commissioner of corporations in the Department of Commerce and Labor, on the United States Steel Corporation, was made public on July 1. It is the result of investigations which the bureau has been conducting for two years past. Frequent references to this investigation were made in the testimony of Judge Gary before the investigating committee of the House of Representatives.

The prominent points on which the report dwells are the formation of the corporation and its capitalization; and the control of iron-ore reserves which it holds. It is not charged that the corporation holds, or intends to hold any monopoly—with the exception of reserve iron-ore supplies. The question of its influence on prices, or the "controlled market" is not considered.

Formation of the Steel Corporation; its causes and results. Value of the properties owned. Its effect on the steel trade.

Organization of the Corporation

The commissioner in his report takes up first the causes of the formation of the Steel Corporation. Until about 1898, he points out, the bulk of the steel business was distributed among a very considerable number of concerns, and there was sharp competition,modified by frequent pools and price agreements. In 1898 began an era of great consolidations, with capitalizations ranging from $3,000,000 to $100,000,000, the ruling motive, as in the earlier price agreements, being the removal of competition.

The creation of new securities for the sake of stock-market profit was, the commissioner holds, an important consideration in these earlier consolidations in the steel industry. "The importance of this stock-market factor in the consolidation movement, whether in the iron and steel industry or in other industries, is too often overlooked. Consolidation, while in large measure an outgrowth of technical and industrial conditions, was by no means exclusively so. Instead there was frequently a marked reluctance on the part of owners to dispose of the businesses they had built up, and in many cases the controlling inducement to sell out was the enormous price obtainable in the securities of these great consolidations."

The report goes at much length into the formation of various companies, such as the Federal Steel Company and the American Steel and Wire Company—which subsequently became subsidiaries of the Steel Corporation. The features of these consolidations were the great expansion of capital and the very large amounts paid as commissions to the promoters of the various companies.

The commissioner points out that the earlier consolidations in the steel business did not accomplish their purpose of removing competition. On the contrary, a broad movement at once became apparent, which threatened competition on a larger scale and probably more severe than ever before in steel history. This movement was the tendency of the larger steel plants, both those which produced crude and those which produced lighter finished products, to extend the entire industrial process from the ore to the finished product, linking up ore and coal mines, transportation, blast furnaces, steel works, rolling mills and finished manufactures.

Such efforts on the part of these great concerns in striving each to integrate or make itself wholly independent, threatened to result in a great and sudden increase and duplication of the steel producing and finishing capacity of the country and to involve them also in an invasion of one another's business. Thus was suddenly disclosed to the industry the prospect of an "impending struggle of giants," a contest between great concerns which might be forced to work out in rigorous competition the survival of the fittest. The critical trade situation in 1900 was intensified, the bureau points out, because of the importance the securities of several of these steel concerns had assumed on the stock market. The report adds:

Preventing a Steel War

"A period of violent competition in the steel industry would inevitably have been followed by a great decline in the value of these securities. This would have been very embarrassing to the financial group which was behind these consolidations. A more important matter was that the financial backers of some of these steel concerns had extensive commitments in other directions, which might be jeopardized by such an acute struggle. From the standpoint of these financiers, therefore, the situation presented at once a great danger and a great opportunity. A steel war might have meant the sudden end of the extraordinary period of speculative activity and profit. On the other hand, an averting of this war and a coalition of the various great consolidations, if successfully financed, would be a tremendous "bull" argument. It would afford its promoters an opportunity for enormous stock-market profits through the sale of its securities. The advantage to these interests also through the concentration of profits in different stages of the industry under a single control were considerable, and there was undoubtedly some advantage to be gained through the further integration which such a consolidation would render possible."

It is clear, the Commissioner points out, that no consolidation of this sort could be successful unless it included the Carnegie Company, and Carnegie's threat to erect a great tube plant near Cleveland, was in fact the spark that lighted this flame.

Quick Dealing in Millions

With amazing swiftness, in the course of only a few weeks, the United States Steel Corporation, according to the report, was organized and began business on April 1, 1901, with a total capitalization of a little more than $1,402,000,000, including bonds. The concerns acquired were the Carnegie Company of New Jersey, the Federal Steel Company, the National Steel Company, the American Steel and Wire Company, the American Sheet Steel Company, the American Tin Plate Company, the American Steel Hoop Company, the American Bridge Company, the National Tube Company, the Bessemer Steamship Company, the Shelby Steel Tube Company, and the Lake Superior Consolidated Iron Mines.

Extent of the Merger

The report says: "By this merger substantially two-thirds of the steel-ingot production and a proportion of the principal rolled-steel products of the country, varying from one-half to four-fifths or more, was transferred to the control of a single concern. The Steel Corporation's share of the total pig-iron production was only about 43 per cent. However, of the output of steel-making pig iron of the country, the corporation's share was not less than 58 per cent.

"The position taken by the Steel Corporation is that this great aggregation of property was in the main an assembling and coördination of different branches in the industry, the primary object of which was to secure greater efficiency and integration and, of course, saving of the payment of profits to others. Their contention is that most of the constituent concerns of the corporation were not in actual competition with one another, and they are disposed to minimize the restriction of competition brought about as a result of this great merger.

"It is true that certain of the constituent consolidations, as for instance

the American Steel and Wire Company and the National Tube Company, were not competing with one another at this particular period. However, there was active competition between the three principal crude-steel concerns—the Carnegie company, the Federal Steel Company and the National Steel Company; while these concerns, to some extent at least, were in competition with some of the large consolidations making the lighter finished products. Moreover, the fact should not be lost sight of that nearly all of the latter class of consolidations were originally created with the intention of restricting competition. A more important matter is that a period of violent competition among all of these concerns was imminent at this juncture and that the United States Steel Corporation was organized for the specific purpose of preventing the new competition thus threatened as well as eliminating that already existing among these concerns. The opportunity for reaping a huge promoter's profit out of this situation undoubtedly was an important consideration in bringing about the merger. Nevertheless, the primary object was the restriction or prevention of competition."

Later Additions

The report adds that the corporation has made three important acquisitions of competing concerns since 1901—the Union Steel Company, the Clairton Steel Company and the Tennessee Coal, Iron and Railroad Company. Of the Tennessee purchase, which has been the subject of so much controversy, the report merely says:

"By the purchase of this company the Steel Corporation secured the leading factor in the Southern iron and steel industry, and what was of more consequence, the extensive ore and coal reserves of that company. The purchase of this concern, which was made in the hight of the panic of 1907, had been preceded by unsuccessful attempts on the part of other interests to use it as a basis of a rival consolidation which would also include the Sloss-Sheffield Steel and Iron Company and the Republic Iron and Steel Company."

Capitalization and Actual Values

The commissioner justifies his effort to determine the relation of the trust's investment to capitalization and earning power on the ground of public policy. He describes the Steel Corporation as the most conspicuous example of the modern corporate organization of great businesses—the greatest industrial concern in the United States.

The total capitalization in 1901, including bonds, was $1,402,846,817, made up as follows: $510,000,000 of preferred stock; $508,000,000 of common stock; $303,000,000 of corporation bonds, and about $81,000,000 of underlying and miscellaneous obligations.

In analyzing the actual value of the physical properties upon which this huge capitalization was based, the bureau adopted three methods—first, by historical study of the organization and investment of the constituent concerns at the time of their formation; second, by a computation of the public estimate of the value of the properties of these constituent concerns, as reflected in the market prices of their securities, and, third, by a detailed estimate of physical properties classified by departments of business. The results of this investigation are condensed in the accompanying table, which compares the valuations made by the corporation itself in 1902, with the property values as appraised by the commission's experts.

Class of Property	Bureau's Estimate of Tangible Values in 1901	Corporation's Estimate of Tangible Values in 1902	*Difference
Ore property	$100,000,000	$700,000,000	$600,000,000
Manufacturing plants, including blast furnaces	250,000,000	348,000,000	98,000,000
Railroad, steamship and dock property	91,500,000	†120,340,000	28,840,000
Coal and coke property	80,000,000	100,000,000	20,000,000
Natural gas property	20,000,000	20,000,000	.....
Limestone properties	4,000,000	4,000,000	.....
Cash and cash assets	136,500,000	‡164,660,000	28,160,000
Total	$682,000,000	$1,157,000,000	$775,000,000

*A part of the differences between the two estimates is accounted for through additions made to property during the interval from April 1, 1901, to July 1, 1902, such additions, of course, being included in the corporation's figures.

†This figure includes $40,340,000 of indebtedness which was not included in the estimate of the corporation, this addition being made in order to render the estimates comparable.

‡In arriving at this figure purchase money obligations and real estate mortgages of $16,369,000 which were deducted by the corporation, were restored by the bureau to make the amounts comparable.

The valuation in the table is of tangible properties; the valuation by market prices of the securities of the constituent companies gives a total of $793,000,000. In either case the report considers that the total value at the time of the organization was fully represented by the bonds and preferred stock, and that the common stock represented no actual values.

Over three-quarters of the difference in the two valuations is represented by the iron ore; concerning this the report says: "Thus the ore reserves, the dominant factor in the steel industry, are in this valuation of its assets by the Steel Corporation made to stand for the excess of capitalization over the value of tangible assets. And it is true, as is thus tacitly assumed by the corporation itself, that in these ore holdings, under the present status of ownership and control, there exists an earning power in the control of the industry on which rests largely those ultimate intangible merger values which must be invoked in any attempt to justify its great capitalization."

The report says: "The bureau does not contend that the capitalization of the corporation should have been fixed at any one of the valuations here presented. All that is attempted at the moment is to present a comparison of these valuations with the capitalization. The figures show clearly that the entire issue of approximately $508,000,000 in 1901 had no physical property back of it and also considerable fraction, say from one-fifth to two-fifths, of the preferred stock was likewise unprotected by physical property. Even granting that there may have been a considerable value in intangible considerations it is reasonably clear that at least the entire issue of common stock except insofar as what may be termed 'merger value' may be considered, represented nothing but water.

"While, therefore, it is not the purpose of this report to say what should have been the capitalization of the corporation, it is obvious that the company was heavily overcapitalized judged by any reasonable standard."

Since its formation the corporation, so the report shows, has made good from surplus earnings much of the original excess of its capitalization over tangible property. In 1910 the excess was only about $280,000,000, or 24 per cent., as against $700,000,000 in 1901. The total tangible value in 1910 was $1,187,000,000, according to the department's estimate; in 1910, however, as in 1901, all merger values are omitted, as well as all appreciation of actual resources above the actual cost thereof to the corporation.

The report says that the fees and commissions allowed the underwriting syndicate amounted to $62,500,000 net over all expenses and advances, and considers this amount excessive, and as further evidence of overcapitalization.

Earnings and Profits

Going over the earnings as reported up to the close of 1910 the bureau disallows some charges made, and puts the total earnings for that period at $1,100,350,857, against $980,015,834 reported by the company. Operating, administrative and general expenses as well as taxes have been deducted from earnings, also true depreciation. The corporation's allowance for depreciation, the Commissioner holds, has exceeded a necessary allowance. The bureau has carefully determined from the records of the corporation the proper depreciation and has restored the excess of profit. Thus arrived at the average annual rate of profit on the investment from April 1,

1901, to Dec. 31, 1910, was 12 per cent. It was highest in 1902, 15.9 per cent., and lowest in 1904, 7.6 per cent. The yearly rates do not indicate any pronounced tendency, but have on the whole slightly decreased.

The report says: "It must be remembered, however, that 12 per cent. profit for one small concern out of many is one thing. Other concerns may make much less. It is a very different thing when, as in this case, one-half of the whole industry has been maintained on the level of a 12 per cent. profit. It must be made entirely clear that this 12 per cent. is the rate of profit on the whole investment. Were that part of the investment deducted which may be said to be borrowed money, chargeable only with a lower rate of return, the rate of the remainder, on that part which may be considered as put in by the stockholders, would be considerably higher."

Present Position of the Corporation

In discussing the Steel Corporation's relative position in the industry the report says that in pig-iron production it has just about maintained its original position of 43.2 per cent. In steel, crude and finished, it has lost ground, controlling 66 per cent. of the steel ingots and castings in 1901 and in 1910 only 54 per cent., notwithstanding great additions to its capacity. Rolled-steel products generally show an almost steady loss.

"While these statistics," the report says, "show the existence of active competition and production, it should be distinctly understood that such competition has not been so evident with respect to prices, where it has been materially modified by the existence of a price policy described as coöperation."

The bureau of corporations adds that while the steel trust's proportion of both raw materials and finished products thus shows a marked decrease, the proportions given do not fairly represent the true position of the corporation in the industry as a whole. In efficiency, location of plant and equipment—in capacity rather than actual production—the corporation is said to be materially stronger than the figures indicate, and in case of continued trade depression this strength would show itself in increased control.

In the coöperative system of price regulation the position of the corporation gives it a dominant influence. While it cannot absolutely control other companies, it can exercise an influence which must be acknowledged.

The Control of Iron Ore Reserves

The report gives much prominence to the control of iron-ore reserves held by the Steel Corporation. This now includes about 75 per cent. of the directly available ores in the Lake Superior region, besides a great tonnage of lower-grade ores which may hereafter become commercially available; and a very large tonnage in the South. In this is found a nearer approach to monopoly than anywhere else in the operations and organization of the corporation. The total ore reserves controlled are estimated at 2,500,000,000 tons.

The report condemns the Great Northern ore lease, and says: "The only reasonable explanation of this extraordinary transaction is that the Steel Corporation desired to prevent this ore either from being mined and sold to independent producers, thus possibly depressing the price of ore, or from being utilized by the Hill interests to build up a new and dangerous competitor in the iron and steel business, thus depressing the market prices of iron and steel products. The Steel Corporation was the only concern in the iron and steel business which was strong enough financially and which had a sufficiently large productive capacity even to consider the taking over of such a large quantity of ore at such a high royalty. . . . .

"The high royalty named in this lease, therefore, instead of being indicative of a marked enhancement in ore values, is rather evidence of the extent to which the Steel Corporation was willing to go in order to prevent this ore from falling into the hands of rival interests."

The lease system, so generally in use in Minnesota, is referred to in this connection as enabling a corporation to control a large ore property with little immediate expenditure for purchase.

Control of Ore and Transportation

The report says, in conclusion: "The dominating position in the ore industry enjoyed by the Steel Corporation through this great ownership of ore reserves is hightened because of its very marked degree of control of the transportation of ore in the Lake Superior district. The corporation controls two of the most important ore railroads, the Duluth & Iron Range Railroad and the Duluth, Mesabi & Northern Railway. The ore rates on these railroads are about 1c. per ton-mile. Their operating expenses are very low, that of Duluth, Missabe & Northern in 1910 being below 30 per cent. of gross earnings, as against an average of 66 per cent. for all the railroads of the country. The net earnings of these ore railroads, which are chiefly from the ore traffic, are phenomenal. This has the practical effect of reducing the Steel Corporation's net cost of ore to itself at upper Lake ports, and on the other hand of increasing that cost to such of its competitors as are dependent upon the corporation's railroads for transportation.

"Hence, not only on account of its great holdings of ore, but also on account of these peculiar advantages enjoyed in the transportation of the ore, the Steel Corporation occupies an extremely commanding position in the iron and steel industry. Indeed, insofar as the Steel Corporation's position in the industry is of monopolistic character, it is chiefly through its control of holdings and the transportation of ore."

Wire Officials Indicted

On June 29, the Federal grand jury, in New York, handed down indictments against 84 wire officials and employees, representing about 35 companies. They are charged with having offended against the Sherman anti-trust law by forming nine pooling associations which are said to have acted in restraint of trade. The indicted men are officers and representatives of the following associations: Telephone Cable Association, Bare Copper Wire Association, Weatherproof and Magnet Wire Association, Fine Magnet Wire Association, Horse-Shoe Manufacturers Association, Underground Power Cable Association, Rubber Covered Wire Association, Lead Encased Rubber Insulated Cable Association and Wire Rope Association.

These indictments are the culmination of a series of investigations which were started early last May. It is stated that more than 80 witnesses were examined, and that in so doing, care was exercised to avoid examining those most closely allied with the conduct of the associations in order to make it impossible for such men to plead immunity. It is not charged that these associations are still in existence; it is believed that most of them went out of business in 1909, following advice received from Federal authorities in 1908, when the latter were asked by lawyers acting for the associations, as to their opinions regarding the pools. The evidence secured leads the Government to believe that the members of the associations have since then carried out the plans, the purpose for which the associations were formed. These plans included the allotment of certain amounts of business to the companies represented, this being agreed upon by mutual consent. In the event that certain companies did more business than was allotted to them, they were required to pay penalties.

The indictments were made personally against the men involved, and not against any companies or associations.

Gold production of Tasmania for 1910, according to the complete report, was 37,048 oz., or 7729 oz. less than in 1909. Other production reported in 1910 included 51,227 tons silver-lead ore; 8193 tons blister copper; 671 tons copper ore; 3701 tons tin ore; 67 tons tungsten ore; 11 tons bismuth ore and 120 oz. osmiridium. Coal mined was 82,445 tons, an increase of 16,284 tons. Oil shale mined was 364 tons. The total estimated value of the mineral output was £1,432,193, a decrease of about 10 per cent.

The Development Company of America

In order to satisfy the creditors of the Development Company of America, the following securities were sold at auction in New York, June 2, for $100,000; $1,015,000 Imperial Copper Company 6 per cent. bonds; $30,000 Development Company of America, 15-year 6 per cent. gold trust bonds; $250,000 Tombstone Consolidated Mines Company, 6 per cent. special contract bonds; 100,000 shares Tombstone Consolidated stock; $725,000 demand notes of the Imperial Copper Company and $1,500,000 of Tombstone Consolidated demand notes. It is stated that these securities were bought by interests friendly to the Development Company.

The Subsidiary Companies

The Development Company of America was incorporated in Delaware, Nov. 23, 1901, with authorized stock capitalization of $3,000,000 and bonded debt of $5,000,000. It owned the entire stock of the American-Mexican Lumber Company and the Congress Consolidated Mines Company, Ltd., and controlled the Poland Mining Company, Lookout Copper Company, Imperial Copper Company and the Tombstone Consolidated Mines Company.

The American-Mexican Lumber Company, owning 500,000 acres of pine lands in the state of Chihuahua, Mexico, is capitalized at $5,000,000. The Congress Consolidated Mines Company, Ltd., capitalized at $5,000,000, owns a gold mine in Yavapai county, Ariz., the workings of which extend to 2050 ft. below surface. The property is equipped with two 40-stamp mills, cyanide plant and modern surface mine equipment. In 1906 and 1907 $150,000 in dividends was paid to the Development Company of America.

The Poland Mining Company is capitalized at $3,000,000, of which the Development Company of America owned $1,452,620. There have also been issued $1,000,000, 7 per cent. income bonds. The property is in Yavapai county, Ariz., and the veins were worked to a depth of 900 ft. The 20-stamp mill shipped iron concentrates to the Sasco smeltery, and lead concentrates to the smelting plant at Needles. The Lookout Copper Company, capitalized at $2,000,000, of which the Development Company of America owned $1,700,000, owns properties in Yavapai county.

The Imperial Copper Company is capitalized at $5,000,000, and has issued $2,000.000 income bonds, of which the Development Company of America owned $2,505,000 of the former and $1,015,000 of the latter. The company owns all the stock of the Arizona Southern Railroad Company, and the Southern Arizona Smelting Company. The mines are at Silverbell, Pima county, Ariz. Shipments began in September, 1903, and to July, 1908, the mine had produced 22,000,000 lb. of copper, as well as some silver and lead. Two dividends of $100,000 each were paid in 1906 and 1907. The smeltery, at Sasco, was blown in early in 1908. The Tombstone Consolidated Mines Company is capitalized at $15,000,000, of which the Development Company of America owned $6,500,000; the income-bond issue was $3,000,000, 6 per cent. The 67 mining claims owned by the company are at Tombstone, Cochise county, Ariz.

The Discovery of Tombstone

Tombstone was discovered in 1878. The ore contained gold, silver and lead. At first the silver was the principal valuable constitutent of the ore, but as the mine workings were extended in depth, it was found that the proportion of gold to silver rapidly increased, so that the value of the gold greatly exceeded that of the other metals. The camp became one of the largest in the Southwest and produced about $35,000,000. At a depth of 560 ft. below surface the water level was reached, where the flow was so great that all attempts to control it failed and the miners were obliged to discontinue operations.

The Problem of Unwatering the Mines

About seven years ago, E. B. Gage and associates brought together the principal properties under one ownership. Funds were raised through the Development Company of America, which were then thought ample to install the pumping equipment necessary for working the mines at greater depth and to provide for such developments on the deep levels that would place the properties in such a position that production could be commenced.

A modern four-compartment shaft, equipped with a steel headframe, was sunk to the 560-ft. or water level, where a station was cut for pumps capable of raising 1750 gal. per min.. When the shaft was cut to a depth of 700 ft., another pumping station was cut and equipped and a third pumping installation was made at the 800-ft. level. The shaft was bottomed at 1000 ft., and on that level a large pumping plant was built.

Upon reaching the 1000 level, drifting was started to cut under those parts of the mines from which the $35,000,000 was produced. Oil was being used as fuel. An accident occurred to the fuel-supply pipes, and by the time repairs had been made the water had risen to the 800 level. An attempt was then made to recover the pumps on the 1000 level by using four sinking pumps, but as this was unsuccessful, the installation on the 800 level was enlarged by adding a plant practically duplicating that on the 1000 level. The heat from the exhaust of the pumps was so great, that a compressor was installed to operate the sinking pumps by air. Just as the 1000-level pumps were being recovered another accident occurred to the boiler plant; during this delay the water again rose to the 800 level. Arrangements were then made to reduce risks from accidents to the boiler plant, and the lowest pumps were recovered and drifting to the ore was resumed. The total pumping capacity was 10,000,000 gal. per day.

Funds Prove Insufficient

The funds realized from the sales of securities proved not to be sufficient, and in order to go on with the elaborate prospecting campaign, large sums of money had to be borrowed. Not having the mine on a paying basis soon resulted in the exhaustion of the company's credit, and on Jan. 19, 1911, pumping was stopped.

Steps are now being taken toward a reorganization of the subsidiary companies, the securities of which were recently sold, so that funds may be raised for resuming the work at Tombstone.

About 125 men are now working for leasers in the old stopes above water level, and besides paying royalty, are making a fair profit. After the reorganization it is possible that a new scheme will be followed to reach the lower parts of the orebodies; the shoots will be followed downward and the water level lowered only as developments in the ore require.

Bear Lodge District, Wyoming

Special Correspondence

A mining boom of small proportions is now in progress in the Bear Lodge mountains, in Crook county, eastern Wyoming. The district has been prospected and gold veins known to exist for a number of years, but within the last year developments have been more encouraging, and the first mill to be erected in the camp is now being taken in. The mines are 20 miles from a railroad, which fact has probably retarded their development. The country rock is largely Algonkian slate, cut by numerous well defined dikes of porphyry, phonolite and trachite; the best veins so far opened, lying on the contact between the slates and the eruptives. Sundance, Wyo., is the nearest town and outfitting point. E. A. Bock has recently installed an air compressor and drills and is blocking out ore for the mill. The plant, which was purchased from the Montezuma company, at Rochford, S. D., consists of a crusher, Huntington mill and concentrators, and is to be equipped with a cyanide annex. A large portion of the machinery is now on the ground and excavations for the mill are well under way.

The Health of Tasmanian Miners

By Frederick L. Hoffman *

State investigation shows that cases of miners phthisis are less numerous in Tasmania than on the mainland. Spraying and ventilation are important preventive measures in dry mines.

*Statistician, Prudential Insurance Company, Newark, N. J.

The reports of the chief inspector of mines of Tasmania for the last few years contain some interesting and instructive observations upon the health of miners which are deserving of the careful consideration of mine managers in America. While the mining industry of Tasmania is of rather limited extent, it is the most important industry in the state, employing about 6000 men and producing a mineral output of the value of about $8,000,000 per year. The number of employees has decreased from a maximum of 7516 in 1905 to 6054 in 1910. The accident rate has rarely exceeded 2 per 1000, and during recent years it has generally been below 1 per 1000 except during 1903 and 1904. During 1910 the fatality rate was only 0.99 per 1000, while the non-fatal accident rate was 8.1. Since there were only six fatal accidents during the year it is significant that these all occurred in the western district, no fatal accident having occurred in the four other districts of the state.

Prevalence of Miners Phthisis

Concerning the health of miners, it was stated in the report for 1908 that inquiry had been made of the medical officers in the various mining centers, and also of the chief health officer of the state, with reference to the occurrence of ankylostomiasis, or miners' worm disease, but the results had been negative and apparently the disease was unknown in Tasmania. With reference to lung diseases, however, generally known as miners phthisis, it was pointed out in 1908 that how far it was prevalent, and to the extent to which it was contracted in the mines of Tasmania, were matters concerning which the chief inspector had not been able to obtain definite information. The chief health officer, Doctor Elkington, however, reported that the disease was not so prevalent as in some other mining districts of the commonwealth of Australia, and that until phthisis was proclaimed a notifiable infectious disease it would not appear possible to obtain concise information of the occurrence of such cases among the mining population. The foregoing statement was amplified by the following suggestive conclusions:

"Men who are working rock drills may be expected to be those who would show the most acute and unmistakable symptoms. The rock dust which they inhale is the primary and producing cause of the disease, and machine-drill men are undoubtedly more exposed to it than any other class of miners. Dry mines and dry holes are conditions favorable to the contraction of this distressing and disastrous complaint. Apart from the rules attached to the Mining Act, the impulse of common humanity should inspire mine owners to adopt every measure or appliance calculated to prevent the deadly inhalation of rock dust by those whom they employ underground. The inspectors have been enjoined to be especially on the alert in this matter. For the ordinary dust after firing, and in connection with work in dry stopes, much relief can always be given by adequate ventilation and avoiding the return of men until the dust caused by blasting has been dissipated."

State Aid Requested

During 1909, however, more extended consideration was given to the health of miners, the Miners' Association at Zeehan[1] having requested the government of Tasmania to subsidize its sustentation fund for the relief of miners incapacitated by lung trouble acquired in pursuing their work in the mines. The chief inspector, therefore, considered it necessary to pay more attention to the question of miners phthisis and to inquire more fully into the extent to which it existed in the state. First of all he observes in his report for 1909 that in other countries, and in neighboring states of the commonwealth of Australia, the prevalence of this complaint in recent years had aroused attention and led to most elaborate inquiry. The fact had been established that the mortality rate from lung diseases among quartz miners at Bendigo had been seriously on the increase during many years, and that there had been a corresponding increase from tuberculosis among miners' wives. In Western Australia also unfavorable reports had brought the subject to public attention, and an equally high mortality, due to similar causes, had been ascertained to prevail among miners in the Transvaal.

Efforts to obtain full information respecting the occurrence of miners phthisis in Tasmania had not been successful, but, according to the chief inspector, no reasonable doubt existed that miners phthisis had occurred for some years in Tasmania, though not to the extent experienced in some of the other states of the Australian commonwealth. The health department had not been able to furnish the necessary statistics, but the new chief health officer, Doctor Purdy, an authority on miners' diseases, had examined carefully into the facts and prepared an elaborate report on the subject, which was appended to the mine inspector's report for the year 1909, published in 1910, as a contribution toward a better understanding of the subject. Doctor Purdy had made a special investigation of the disease at Zeehan, in coöperation with the surgeon-superintendent of the Launceston hospital. Concerning miners' lung disease, its nature, symptoms, and exciting causes, the report of the chief inspector for 1909 states in part that:

Factors Causing Lung Diseases

"It appears that during continued daily work in an atmosphere which is heavily charged with stone dust, the minute particles of dust infallibly work their way into the ramifications of the bronchial tubes which traverse the tissue of the lung. The sharp-edged particles injure and penetrate the tube walls; the lung tissue is eventually replaced by new fibrous tissue; the air spaces of the lungs diminish in area, and the organs ultimately become useless to the individual, and readily receptive of true tuberculosis disease (pulmonary consumption). The type of disease which results from the inhalation of stone dust is known by the name of silicosis, to distinguish it from allied diseases caused by wool, cotton, metal dust and the dust of coal mines. The coal miners' lung disease is called anthracosis; that of iron miners has received the name of siderosis; and of cotton factory workers, byssinosis. The group name for dust lung disease is pneumokoniosis."

After quoting extensively from the leading authorities on dusty trades, particularly Dr. Thomas Oliver, the author of "Dangerous Trades"; Doctor Haldane, author of the report on "The Health of Cornish Miners," and Doctor Summons, author of the report on "The Occurrence of Miners Phthisis at Bendigo," the chief inspector considers briefly the available information relating to lung trouble among miners in Tasmania, considering each individual case which had been brought to the attention of the inspectors, emphasizing the cause of death, the duration of mine experience, etc. Referring to the Zeehan district, it is said in explanation of the comparative freedom from disease associated with the inhala-

[1]For an extended account of the orebodies of the Zeehan field, see *Bulletin* No. 8 of the Tasmania Department of Mines, Hobart, 1910.

tion of dust, that in the main the mines of that district were found to be wet, and also that there were practically no quartz mines in operation. Some cases were found in the Lyell district, and quite a number of cases in the Mathinna district. Concerning this latter district in detail, it is pointed out (p. 88) that:

"The North Lyell mine is on the whole moist, and on a recent visit I did not see that dust from the rock drills was being produced in dangerous quantity. In the dry pyrite body of the Lyell mine, however, the dust created by the machines is considerable, but is greatly allayed by the spraying apparatus provided by the company. I saw this in operation, and noticed its efficacy and the increased coolness of the air after its application. But the men have some objection to it, based on the idea that the finely divided and dust-laden water is carried into the lungs."

With further reference to the occurrence of lung diseases in the Mathinna district, it is stated that the disease attaches itself most readily to miners working rock drills, though, of course, it is said that other miners are exposed to it but in a less degree, and in their case the development of the complaint may, and even does, spread itself over the entire working life of the patient.

The special factors which govern the occurrence of lung diseases in rock-drill miners are stated to be: first, the dryness of the mine; second, the speed of the drill, and, consequently, the quantity of dust produced; third, the drilling of dry holes (usually uppers); and fourth, the dust created in blasting. It is an obvious inference that, given a dry mine and confined working places, and faces at great distances from the natural ventilation current and with insufficient ventilating appliances, the conditions exist which highly favor the creation of silicosis, which, of course, is the equivalent of lung disease caused by industrial mineral dust.

Methods of Prevention

Concerning methods recommended to diminish the evil of dust exposure and dust inhalation, it is said that these resolve themselves, first, into destroying the dust by water jet or spray; second, by aiding in the removal of dust by attention to ventilation; third, by preventing the contamination of air by attention to ventilation; and fourth, by preventing the introduction of tubercular phthisis by exclusion of such sufferers from the mine. While the evidence may not have been conclusive to prove an alarming or even serious state of affairs, it is evident from some of the observations in the report that some of the press comments had gone so far as to suggest the discontinuance of the mining industry upon the ground of health conservation, but in the opinion of the chief inspector it was certain that the remedies suggested, if enforced, would be found practical and effective.

Unfortunately, however, the inspector points out, "many miners themselves prefer dangerous working conditions to personal discomfort, and are dominated by opinions antagonistic to the proposed remedies. Inspector Curtain mentions that the spray used in the Mt. Lyell mine is condemned generally by the miners, who allege that it does not allay the dust, but makes it slimey, and that they prefer the latter in a dry form. The answer to this objection is, that the slime, if any exists, enters only the alimentary canal, but is not carried into the lungs."

Unlimited Spraying Undesirable

It is admitted in this connection that atomizers produce a steamy humidity of the air, which is distinctly uncomfortable, and in a tropical temperature seriously affects a miner's working power. It is stated, therefore, that in the opinion of the best authorities, where a high temperature prevails in the workings, a limit of atmospheric saturation should be adopted, beyond which spraying should not be permitted. Evidently, however, the low temperature of Tasmanian mines makes it a comparatively easy matter to cope with this difficulty.

With reference to the complaint that the compressed air escaping from rock drills usually carries particles of oil and other impurities, it is said that if the drills are kept clean much of the objection falls to the ground.

The duty of the state is emphasized in the matter of safety and comfort as well as of a requisite amount of special attention to the spread of tubercular phthisis by means of personal infection. It is held, however, that improved health, or perhaps more strictly speaking, arrest of the disease, in many cases may be obtained by change of occupation or by removing to open-air conditions. Summarizing the foregoing facts and observations, the conclusion is advanced "that while pulmonary disease has not made the inroads among miners in Tasmania that it has made on the mainland, it is undoubtedly present to some extent. Its prevention and relief are matters which must receive conscientious attention and consideration by all who are charged in any way with the preservation of the public health."

Nitrate Production of Chile

The production of Chilean nitrate for 1911 is estimated (*Bull.*, Pan American Union, May, 1911) at 55,000,000 quintals, as compared with 53,595,000 for 1910. There are nine new nitrate establishments in process of construction. It is probable that none of these will begin operations until next year.

The New Oilfield at Carlyle, Illinois

By H. A. Wheeler

The Illinois Geological Survey is entitled to the credit of starting the prospecting that found the new oilfield at Carlyle, Clinton county, Ill. Its investigations indicated an anticline on the western side of Carlyle, to which attentention was called as a favorable place for oil. On the strength of this recommendation, oil leases were taken by several prospectors, and a couple of holes were drilled two years ago about a mile south of town. As both holes were dry, the company surrendered its leases and abandoned the field; it is highly significant, however, that it intended to drill its first hole on land that has since proved rich, but the importuning of a landholder who held large tracts south of the town finally prevailed, and the company abandoned the 80-acre location that now proves to be in the heart of the pool and on the crest of the anticline. This blunder of considering quantity rather than quality, is frequently made by oil men, who too often will drill where they can get big acreage, rather than to first secure acreage on the anticline, even if limited. In other words, in playing the game they deliberately take overwhelming odds against themselves, rather than play for smaller stakes with chances in their favor.

Oil Found at 1000 Feet

Last October, the Surpass Oil company, of Pittsburg, started a hole on the Murphy farm, four miles northwest of Carlyle, on what was supposed to be the anticline. After considerable hard luck in losing tools and getting the hole crooked, they finally brought in a light well on March 11, 1911, at a depth of about 1000 ft. While it was reported to be a paying well, it only produced about 10 bbl. after being shot, and the oil scouts who had been watching it, decided that the district was a good place to let alone. A showing of gas occurred at 710 ft. and a little oil and gas also occurred at 850 feet.

Another hole was immediately started by Frank Ranger on the Smith farm, one-half mile south of the Murphy well, and he also got a light well at about 1000 ft. Instead of stopping there, and in spite of being in severe financial straights, he drilled deeper, and on April 8, at 1030 ft., brought in an 80-bbl. well that made over 200 bbl. after being shot. The news of this Ranger well soon circulated among oil men, and within 48 hours oil operators and speculators began flocking into Carlyle from all over the country, until the little town could scarcely take care of the rapidly growing crowds. The mar-

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ket for oil leases immediatery began to boom. Leases that could have been picked up for from $5 to $10 per acre before the Smith well came in, rapidly advanced to between $50 and $200 when within three miles of the well, and to between $20 and $50 when five to 10 miles out. Leases that were 15 miles from production brought from $5 to $15 per acre.

The shallowness of the field, its proximity to St. Louis and the promising condition of the oil industry, made oil men anxious to get territory, and many immediately started drilling without waiting for developments to show the direction of the pool. Holes were located as far as 10 miles from the discovery well, and the excitement of the old-time oil operators from Pennsylvania, Ohio, Eastern Illinois, Oklahoma, and even California, was as feverish as in a tenderfoot boom.

Today, within 60 days from the bringing in of the Smith well, about 24 holes have been completed, and nearly as many more are drilling. Of these, 12, or 50 per cent., are producers that average about 150 bbl., ranging from 25 to 500 bbl. This also includes the Murphy No. 1, or pioneer well, which, on being deepened about 30 ft., came in as a "century" producer that makes a natural flow every five minutes. Considering the lack of discretion used in locating many of the holes, this is a good showing for a new field.

Position of Oil-bearing Sandstone

The 1030-ft. sandstone that produces the Carlyle oil is 20 to 30 ft. thick, lies near the base of the coal measures, and is about 600 ft. below the No. 6 coal seam that is so extensively worked in western Illinois. It is supposed to be the same horizon that carries, at about the same depth, the gas well at Greenville, 18 miles north, the oil and gas at Butler and Litchfield in Montgomery county, the gas at Carlinville, in Macoupin county, and the gas at Livingstone, in Madison county. In this event, the Benoist sand, that carries the fine wells at Sandoval, 15 miles east of Carlyle, should occur at about 1300 ft. It occurs at 1540 ft. at Sandoval and lies about 1000 ft. below the No. 6 coal; with the rise and thinning of the formations to the west, it may be expected at about 1300 ft. at Carlyle, where it is probable that it will make even better wells than the 1030-ft. sand.

The 820-ft. sand at Carlyle is also likely to yield paying oil and gas wells. On the McCabe farm, a 2,000,000-ft. gas well was struck recently at this horizon, while on the Schlafley farm it promises to make 25- to 50-bbl. wells. There are also possibilities of finding paying wells in the Old Ripley sand at Carlyle, which may be expected at about 1900 ft., while the Trenton limestone is likely to be found at about 2750 ft. The latter formation has promise of being an important producer, judging by its condition where it outcrops in Missouri and northwestern Illinois, although it has never been tapped in western Illinois, where the structural conditions are favorable for expecting oil or gas. Whether the Carlyle field will prove as rich as the Bridgeport field of eastern Illinois remains for future developments to show.

The Carlyle oil is a high-grade, dark, "sweet" or nonsulphur-bearing refining oil of 37 deg. B. gravity. Ample gas occurs with the oil, so that the wells flow naturally. The oil today is selling for 63c. per barrel, the present price for Illinois oil.

The supply houses established local branches, and a pipe line was laid to a loading rack on the Baltimore & Ohio railroad, within two weeks after oil was struck. A 6-in. pipe line is now being laid from the Sandoval pump station.

Cement Industry in 1910

The statistics of cement production in 1910, as reported by Ernest F. Burchard, of the U. S. Geological Survey, indicate that the cement industry ranks within the first eight extractive industries in the United States, the value of the cement produced being exceeded only by the value of the coal, pig iron, petroleum and gas, clay products, copper, gold and stone.

The total quantity of portland, natural and puzzolan cements produced during 1910 was 76,934,675 bbl., valued at $68,052,771. This was an increase of 10,244,960 bbl., or 15.3 per cent. in quantity, and of $14,442,208, or 26.9 per cent in value, over the figures for 1909. The increase in quantity is one of the largest ever recorded, and the fact that the increase in value was proportionately higher indicates that trade conditions were slightly more satisfactory than during 1909.

Portland cement constituted the main item in this output, the total for the year being 75,699,485 bbl., valued at $67,506,479. This quantity is equivalent to 12,841,430 long tons, valued at $5.26 per ton. It approximates 47 per cent. of the quantity of pig iron produced in 1910. The average price per barrel in 1910, according to the figures reported to the Survey, was a trifle less than 89.2c. This represents the value of the cement in bulk at the mills, including the labor cost of packing, but not the value of the sacks or barrels. The prices ranged generally between 72.7c. per bbl. in the Lehigh district and $1.38 on the Pacific coast. While the average price for the whole country increased from 81.3c. in 1909 to nearly 89.2c. in 1910, with corresponding increases in the eastern, central, southern and western districts, the average price in the Pacific coast States dropped from $1.52 to $1.38, a decrease of 14c. per bbl., due, no doubt, to the advent of new mills in California, the Rocky Mountain States, and western Texas and to the increased capacity of other plants supplying the coast territory, where attractive prices have hitherto prevailed.

The number of producing plants increased from 108 in 1909 to 110 in 1910, but the total number of rotary kilns in operation decreased from 930 to 900. The figures indicate, however, that the proportion of large kilns is increasing, 471 kilns 100 ft. or more in length being reported in 1910.

PORTLAND CEMENT PRODUCTION

State	Producing Plants	Quantity (bbl.)	Value
1910			
Pennsylvania	25	26,675,978	$19,551,268
Indiana	5	7,219,199	6,487,508
Kansas	11	5,655,808	5,359,408
California	7	6,385,588	8,843,210
Washington	2		
Illinois	5	4,459,450	4,119,012
Missouri	4	4,455,589	3,858,088
New Jersey	3	4,184,698	3,067,265
Michigan	12	3,687,719	3,378,910
New York	7	2,445,884	2,207,230
Texas	4	2,287,445	2,664,846
Oklahoma	2		
Iowa	2	2,010,379	1,986,694
Kentucky	1		
West Virginia	1		
Ohio	5	1,527,670	1,279,717
Alabama	2	1,481,359	1,323,495
Georgia	1		
Tennessee	1		
Maryland	1	1,206,158	830.218
Virginia	2		
Arizona	1	1,204,761	1,543,620
Colorado	2		
Montana	1		
Utah	3	811,800	1,005,960
Total	110	75,699,485	$67,506,479
1909	108	64,991,431	52,858,354

The portland-cement plants in the East, including plants in Pennsylvania, New Jersey, New York, and Massachusetts, produced 33,306,560 bbl. in 1910, at an average price of 75c. per bbl. The plants in the central States—Ohio, Indiana, Michigan, Illinois, Iowa and Missouri—produced 22,617,009 bbl. at 91c. The plants in Kansas, Colorado, South Dakota, Utah, Arizona and Montana, included under "Western States," produced 7,672,369 bbl. at $1.03. The Pacific Coast plants in California and Washington, produced 6,385,588 bbl. at $1.38. The plants in the South, located in Maryland, Virginia, West Virginia, Kentucky, Tennessee, Georgia, Alabama, Oklahoma and Texas, produced 5,717,959 bbl. at 94c. The accompanying table gives the 1910 production of portland cement by States.

Peruvian Salt Production

The National Salt Company holds the exclusive right to exploit the salt industry in Peru and at present is operating more than 100 deposits. The value of the salt production of Peru for 1910, according to the May *Bulletin* of the Pan American Union, was £93,238, an increase of £5944 over the previous year.

Dredging for Gold in California

By Lewis H. Eddy*

Three counties embrace the important fields, with small scale operations in eight other counties. Increased production obtained largely by improved machinery; buckets of 15 cu. ft. capacity now in use. The steel hull has been introduced for digging in tight gravel without the assistance of monitors.

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Mining for placer gold in California by the modern bucket-elevator type of dredge on a large and profitable scale, occupies several important fields in three counties in the central northern half of the State, and extends on a lesser scale into eight other counties lying north and east and southeast of San Francisco. The counties in which the greater fields are situated are Butte, Yuba, Sacramento. The eight other counties in which varying types, including the bucket-elevator dredge, are employed, are named in their geographical order from north to south and east: Siskiyou, Trinity, Shasta, Placer, Calaveras, Stanislaus, Merced, Monterey.

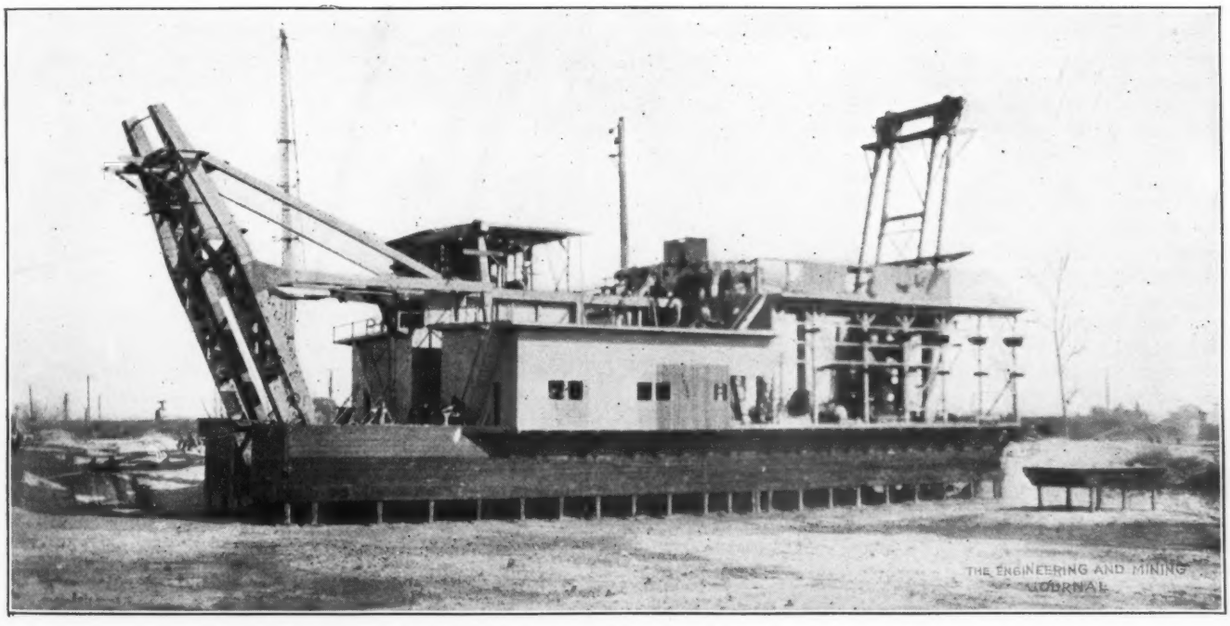
Dredge Improvements

The production of gold by dredging in California in the first half of 1911 is estimated at $4,000,000. The continuous advance in production, particularly in the last three years, is marked not by increase in the number of dredges installed nor the total number operated, but by constant improvement in machinery efficiency and multiplication of strength of all new construction of both small and large types of dredges, and by the enlargement of boats and increased bucket and aggregate dredge capacity to meet the physical and economic requirements of certain gravel fields. The increase in bucket capacity to 15 cu.ft., advancing the digging depth from 35 to 65 ft. below the water line, increase in yardage from 350 to 600 cu.yd. per hour, extending the area of gold-saving tables from 900 to 8000 sq.ft., and the introduction of the steel hull are details of material comparison in construction of the largest dredges built in 1908 and the largest to be in construction in 1911 in the three chief dredging divisions. The increased demand for dredges built especially for operation of old hydraulic and placer mines at interior points, and for the handling of mine tailings indicates that there is no decline in the smaller type of dredges. While the improvement in efficiency and increase in aggregate capacity appear to meet all present demands, the limit of possible capacity of the gold dredge is not admitted, by competent engineers in the field, to have been reached in the present construction.

The reduction in working costs of approximately 50 per cent. by these improvements may not be greatly extended by further increased capacity and strength. The working cost is an element somewhat dependent upon the varying character of the ground, which is not always easily determined by the prospecting drill; but a minimum may now be safely estimated and a closer conclusion reached as to the margin of profit to be expected from a given field. The time necessary for the completion of a field is greatly diminished.

Present Active Dredging Area

A conservative estimate of area of present active gold-dredging fields in California gives an aggregate of 16,600 acres in 11 countries. In 1909 the proven ground was estimated at 19,000 acres; but much of this acreage has been worked out and some fields have been abandoned at least temporarily, while in others the operation has not been constant. The abandonment of a field or the discontinuance of exploitation has, in some instances, resulted from lack of capital in smaller or isolated fields, and in others from the fact that a newer field gave greater assurance of profit and smaller working costs. It is not improbable that some of these abandoned gravel beds will be found profitable under more favorable conditions, or accepted on a basis of smaller margin of profit. There is continued prospecting for new dredging ground, both in the stream regions and the *locale* of the old hydraulic



"Yuba No. 13," a New 15-cu.ft. Dredge for the California Fields

mines. So the life of gold dredging in California may not be said to be marked by the present limit of active digging operation.

Following is a fair approximate distribution of the aggregate acreage to each of the three great divisions, severally, and to the additional eight counties as a whole: Feather river, 3800 acres; Yuba Basin, 3500 acres; American river, 5800 acres; eight additional counties, 3500; acres; total, 16,600 acres. These figures are meant to include only the ground on which active work was in progress in June, 1911, or to be worked in the last half of the year, and do not include any prospective or abandoned fields.

Three Great Dredging Fields

Feather River division, broadly described, embraces all dredgeable lands within Butte county along Feather river, and certain tributaries, including Butte creek to the north and Wymans ravine and Honcut creek in the southeast, besides Oroville and Thermalito fields. Oroville field lies west and south of the town of Oroville, and partially within the town limits, east of the river. Thermalito field lies along the westerly and northwesterly bank of the river, adjoining the town of Oroville on the southwest; this field derives its name from Thermalito school district. There are about 1500 acres in the Oroville field to be dredged, and in the Thermalito field about 1000 acres; the balance, 1300 acres, is distributed in Butte creek, Wymans ravine, and Honcut fields. Yuba Basin division includes active operations at Hammonton and Marigold, on Yuba river. Bear river field is geographically in this division, but in the operative department of the Oroville Dredging, Ltd., it is classed in the Oroville district; as the field has for the present been abandoned it is omitted from this description of area. Hammonton field extends along the southwesterly course of Yuba river for a distance of 5½ miles, chiefly on the southerly side of the new channel, and occupies the bed of the old channel, and has a maximum width north and south of three miles, narrowing in places to one-half mile and less, containing about 2600 acres of present active ground. The Marigold field lies southwest and adjoining the Hammonton field, and contains about 900 active acres. Marigold, the town in that field, is 2½ miles southwest of Hammonton.

American River division embraces lands extending along both banks of the American river, in Sacramento county, in its irregular southwesterly course, from the eastern vicinity of Folsom for a distance of 10 miles to a point north of Cornell. The town of Natoma is situated in about the center of the division, 22½ miles northeasterly from Sacramento. The dredging area is divided into fields known as upper and lower Natoma, and Folsom fields In the whole division there are about 5800 active acres, of which 5600 are in Natoma and about 200 acres in the Folsom field.

The Eight Outside Counties

The active operations in the eight counties other than Butte, Yuba and Sacramento are confined chiefly to one or two boats in each. The situation of these dredging lands is: on Trinity river, in Trinity county; Scott river and McAdams creek, in Siskiyou; Sacramento river and Clear creek, in Shasta; American river, in Placer; Mokelumne and Calaveras rivers, in Calaveras; Stanislaus river, in Stanislaus; Merced river, in Merced; on interior gravel lands in Monterey. The Bear River field is in Yuba and Placer counties. The present active work in Placer is in stamp-mill tailings chiefly, and this extends also across the river into Eldorado county. Operations in Calaveras extend also into Amador and San Joaquin counties.

In Butte, Yuba and Sacramento counties, the W. P. Hammon interests predominate in magnitude of production and operation; in Yuba and Sacramento counties they are the largest dredge-land owners. In Butte county a number of smaller companies own and operate about three-fourths of the present active dredge lands. The Hammon companies are not active in the eight outside counties.

New Dredge Construction

Four new bucket-elevator dredges were put in commission in California in the first half of 1911, and five were under construction, scheduled for commission in July, September and December. Three of these were designed and construction begun in the fall of 1910, and have appeared as the dredge installation, or equipment, of 1910. Important dredge construction for 1911 is reported as follows:

Yuba Construction Company—Five 15-cu.ft. dredges: Four for Natomas Consolidated of California; Natoma No. 8, commissioned Jan. 22; Natoma 9, for commission in July; Natoma 10, for commission in December or January; all in American River division; Feather No. 3, for commission in July in Thermalito field of Feather River division; and one for Yuba Consolidated Goldfield; Yuba No. 13, for commission in July, at Hammonton in Yuba Basin division.

Union Iron Works—One 8½-cu.ft. dredge for Marysville Gold Dredging Company; Marysville No. 4, commissioned April 8, at Marigold in Yuba Basin division. Design and constructional work at Marigold shops.

Risdon Iron and Locomotive Works—Two dredges: One 4-cu.ft.-type for Weaver Gold Dredging Company, commissioned June 1, at Loomis, Placer county; and one 5-cu.ft. dredge for L. Gardella, for commission in September in Oroville field in Feather River division.

The Drexel Estate, at Chico, is reported to have installed a dredge in June on Butte creek, in Butte county, but definite data are not obtainable.

Comparative Construction Details

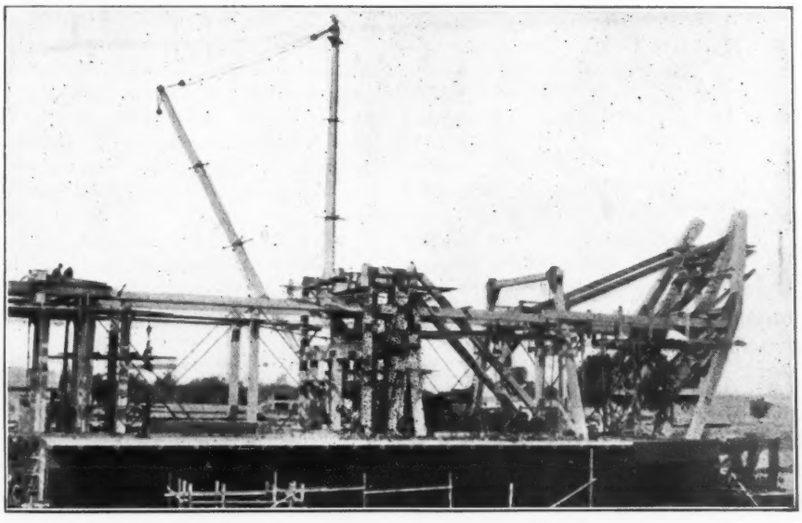
The usual rated bucket capacity of the California-type dredge is commonly employed to designate the size of the dredge; but this designation does not apply always with exactness to similar dredges carrying buckets of equal capacity; nor does the rated or theoretical capacity always indicate the possible working capacity of the bucket. The first gold dredge in California equipped with 13-cu.ft. buckets was installed on American river, in November, 1905, known as Folsom No. 4 (now Natoma No. 4). In May, 1908, Natoma No. 1, equipped with 13½-cu.ft. buckets, was commissioned in the same division. The first of the 15-cu.ft. boats was Natoma No. 8; then followed Yuba No. 13 and Feather No. 3. These are similar in design and general construction, but unequal in dimensions and dissimilar in various important parts designed with respect to the demands of specific conditions in the field. In the order of design and construction the important differences in these dredges are here detailed:

Natoma No. 8 is equipped with 88 and Yuba No. 13 with 90 close-connected, 4200-lb. buckets; Feather No. 3 with 68 plus 13 close-connected, 3500-lb. buckets. The Natoma's hull dimensions are: 150 ft. by 58 ft. by 12 ft. 6 in.; Yuba's, 155 ft. by 58 ft. 8 in. by 12 ft. 6 in.; Feather's, 135 ft. by 58 ft. 8 in. by 12 ft. 6 in. The Natoma contains 732,000 bd.ft. of lumber; Yuba, 750,000 bd.ft.; Feather, 630,000 bd.ft. Length of digging ladder on Natoma and Yuba, 125 ft.; Feather, 89 ft. plus 20 ft. Length of conveyer on Natoma and Yuba, 144 ft.; Feather, 110 ft. Steel spuds, two on each boat: Natoma and Yuba, length, 70 ft., weight 84,000 lb. each; Feather, length, 65 ft., weight 82,500 lb. each. Dimensions of revolving screens on each boat are the same, 50 ft. 6 in. by 9 ft. Total power equipment of Natoma, 720 h.p. plus 250 h.p.; Yuba and Feather, each, 720 h.p. The Natoma is equipped with two monitor pumps, accounting for the added horsepower. Westinghouse Electric machines are installed on Natoma; General Electric on Feather. The Feather is designed for digging two depth, 35 and 50 ft., accounting for the additional number of buckets and the additional length of digging ladder.

Details of Two Small Dredges

The general standard sizes below 13½-cu.ft. buckets, which are well adapted to average field conditions in California, are 7½ cu.ft. and 8½ cu.ft. The latest

of the 8½-cu.ft. boats to be put in commission is Marysville No. 4, designed by R. E. Cranston, of the Marysville Gold Dredging Company. This boat is similar in design and structure to Yuba No. 11, of 7½ cu.ft., in the adjoining field. The essential dimensions of Marysville No. 4 are: Length, 115 ft.; width, 48 ft.; depth, 9 ft. 6 in.; lumber, 400,000 bd.ft.; digging ladder, truss-girder design, 116 ft. long, to dig 65 ft., equipped with eighty-four 2200-lb. buckets, close-connected, dumping 20 per min.; conveyer, 136 ft. long; belt, 32 in. wide; revolving screen 38x6 ft.; steel spuds, 24 in. by 36 in. by 55 ft., of ⅞-in. side and web plates, and ⅞-in. cover plates, and angle-iron joints. General Electric power equipment, rated motor capacity, 455 h.p.; bucket drive, 200 h.p.; winch, 25 h.p.; screen drive, 50 h.p.; 10-in. high-pressure pump, 100 h.p., 10-in. low-pressure pump, 35 h.p.; 4-in. primary pumps, 10 h.p. Transformer capacity, 375 kw.; output, 262 kw.; electric-transmission line, from San Francisco Gas and Electric meter pole, No. 6 copper wire, 600 ft. long; shore cable to dredge, three-conductor, No. 4 copper wire, 450 ft. long; current stepped down at dredge to 440 volts for all motors.



FEATHER NO. 3 DREDGE IN CONSTRUCTION

The constructional differences between Marysville No. 4 and Yuba No. 11, are shown by these details of Yuba No. 11: Length, 130 ft.; width, 46 ft.; depth, 9 ft. 6 in.; lumber, 375,000 bd.ft.; digging ladder, 118 ft., equipped with ninety-six 2000-lb. buckets, dumping 18 per min.; conveyer, 132 ft. long; revolving screen, 36 ft. by 6 ft.; steel spuds, ⅜-in. side and web, and ⅞-in. cover plates. Rated motor capacity, 405 h.p.; electric-transmission line, No. 4 copper wire. In other essentials the boats are alike.

The smaller boats vary in bucket capacity from 1½ to 5 cu. ft. The 4-cu.ft. dredge, built by the Risdon Iron Works, and operating at Loomis, Placer county, is the latest of this type of boats designed for easy ground of a character frequently found in the ancient channel placer and soft drift mines, formerly worked by tunneling and hydraulic methods. These details of construction illustrate the comparison between this and the heavier boats, built for the heavier and more compact gravels in the flood basins and present river channels: Digging ladder, 58 ft. long; conveyer, 40 ft. long; screen set at 7 ft. greater hight than in other boats of similar size. Electric driven: Main drive, 50 h.p.; main pump, 50 h.p.; ladder hoist, 25 h.p.; main winch, 15 h.p.; conveyer, 10 h.p.; screen, 10 h.p. The ground is shallow, 10 to 30 ft., and carries a large proportion of fine material, which is passed through a 10-mesh screen to a new gold-saving device that is being tried out on this dredge before undertaking to put it on the market. Some of these smaller boats are also operated in the Oroville field, where the ground in some sections is of soft and easy-digging character.

PRESENT ACTIVE FIELD OPERATION

Active operation in June in the three chief divisions included 50 dredges, and in other sections of California approximately 11; a total of 61 in 11 counties, and operating on a total of 14 streams, including rivers and creeks, and at two interior points off stream. In Feather River division: 19 in Oroville field; two in Thermalito; one on Honcut creek; two in Wymans ravine; two on Butte creek; total, 26. Yuba basin: 12 at Hammonton; three at Marigold; total, 15. American River division: four in upper and four in lower Natoma field; one at Folsom; total, 9. In the other counties there were, from information obtainable concerning dredges, three in Placer, two in Shasta, and one in Monterey. There are interesting movements in these and other counties respecting recent operation and contemplated construction of various types of boats which cannot, for lack of present full and definite data, be made a part of this writing. Crediting one each to the other five counties, makes a total of 11 in eight counties.

FEATHER RIVER AND TRIBUTARIES

The buckets of the 26 dredges in Feather River division vary in capacity from 3 to 15 cu.ft. On the Oroville side the range is from 3 to 7 cu.ft. On the Thermalito side, 7½-cu.ft. buckets are to be increased to 15 cu.ft.; Honcut creek and Wymans ravine, 4 to 5½ cu.ft.; Butte, 11 cu.ft. The yardage output runs from 20,000 to 50,000 cu.yd. per month for the smaller boats; 95,000 to 125,000 cu.yd. for the medium-size type; and the new 15-cu.ft. boat will dig 300,000 cu.yd. The total aggregate yardage in the first half of 1911 averaged 1,560,000 cu.yd. per month. The Oroville and Thermalito fields combined will increase this average to about 1,900,000 cu.yd. in the last half of 1911 by the addition of new dredges.

The average depth of the gravel on the Oroville side of the river is 35 ft.; on the Thermalito side, 45 ft.; on Honcut creek and Wymans ravine the depth is 10 to 14 ft.; on Butte creek, 12 to 28 ft. The value of the gravel in the division is reported at 9 to 15c. per cu.yd. Water for boat pits and washing gravel in Oroville and Thermalito fields is purchased at the rate of $150 per year per dredge; in other fields natural seepage or intake from streams is used. The dredges are electric driven. Many of the older and smaller dredges in this division are equipped with shaking screens, and all except those built by the Yuba Construction Company employ the spray pipe for washing the gravel. The nozzle method is a device designed by that company.

The names of the operators and the respective number of dredges in Feather River division are: Oroville Dredging, Ltd., five dredges; Natomas Consolidated of California, two in operation, one in construction; Oro Water, Light and Power Company, four; El Oro Dredging Company, two; L. Gardella, two operating, one in construction; L. & J. Gardella, two; James Leggett, two; and one each by Indiana Gold Dredging and Mining Company, Pennsylvania Dredging Company, Ophir Gold Dredging Company, Gold Run Dredging Company, Vilora Syndicate, Butte Creek Consolidated Dredging Company, and Kentucky Ranch Gold Dredging Company.

The companies and individuals operating at Oroville, Thermalito, Honcut creek and Wymans ravine, have their offices or places of business at Oroville; the company on Butte creek, at Chico. The Natomas Consolidated and the Oroville Dredging, Ltd., representing the Hammon

interests in this division, have their field headquarters in Oroville, but J. J. Hamlyn, division superintendent and manager of the shops of the Oroville Dredging, Ltd., has his office on the Thermalito side. Electric power for dredge operation in the Oroville and Thermalito fields is furnished by three companies: Thermalito-Pacific Gas and Electric; Oroville-Pacific Gas and Electric, and Oro Water, Light and Power companies.

Physical Changes at Oroville

In Oroville there has been more marked reduction in dredging area by actually working out, than in any other field in the State. Initially, there were about 4000 acres, but the dredgeable ground was limited to that area, of which more than half has been worked. Four years ago there were 40 dredges in operation; at present the number is about one-half of that. The physical changes resulting from this immense overturning of gravel rendered the town vulnerable to attacks of the flood waters, and necessitated the construction of a dam built of gravel with concrete and cement facing on the river side. The engineering wisdom that conceived this form of structure was questioned, but the efficiency of the dam and the economy of the expenditure of $80,000 were amply proved after it had withstood the first heavy flood and saved the town from inundation and the property owners from heavy losses. Much of the orchard land within the area was destroyed temporarily by dredging, but its renewed value for horticulture is being demonstrated; and the use of the heavy gravel tailings for road work and concrete material, through the operation of the Natomas Consolidated crushing plant, had added to the superficial value of the dredged land. Altogether, the dredging industry has been of much benefit to Oroville, in spite of the early predictions that the dredges were digging a municipal graveyard.

Yuba River Basin Division

Only two companies operate gold dredges in Yuba basin, the Yuba Consolidated Goldfields at Hammonton, and the Marysville Gold Dredging Company at Marigold. These companies own all the gold-bearing dredging lands, as far as prospected and proven, in the basin lands of the Yuba between Marysville and Smartsville. The present active operation extends over an area beginning in S. 33, T. 16 N. R. 5 E. and running southwesterly into S. 1, T. 16 N., R. 4 E., following the course of the river. Yuba Consolidated operates 12 dredges, two of which are of 6 cu.ft. capacity, equipped with shaking screens; the 10 others are of 7½ cu.ft. capacity, and have revolving screens; the spray pipe for washing is being displaced on these larger boats by the nozzle washing device.

The first two boats in this fleet were commissioned in 1904; four in 1905; two in 1906; two in 1907; two in 1908; and numbered in succession of their installment, Yuba Nos. 1 to 12. Yuba No. 13 was nearing completion at the time of a visit to this field in June, and was ready for placing the digging ladder. This boat will operate in the extreme southwest corner of the field on the easterly side of the old State dam site, and about one-half mile southeast of No. 12 dredge; the other 11 Yuba dredges extend easterly a distance of about 3½ miles. The Marysville company dredges Nos. 1 and 3 are situated one mile west of Yuba No. 13; Marysville No. 4, which was put in commission April 8, is situated about half way between Yuba Nos. 12 and 13, and west of the dam site.

The gold-bearing gravel in the Hammonton and Marigold fields of Yuba basin division averages 60 ft. depth. The dredges are digging 40 to 63 ft., and it is expected that Yuba No. 13 will go deeper, probably to 70 ft. The yardage output of the 15 dredges in the two fields is estimated at 1,400,000 cu.yd. per month, to which the new dredge will add 300,000 cu.yd. or more. The value of the gravel for the two fields is reported at from 10 to 30c. per cu.yd. The gravel is made up partially of the hydraulic tailings brought down by the flood waters in the earlier years of California mining, but the pay lies beneath these tailings in the old river gravel overlying the volcanic-ash bedrock of the former channel of the river. The profitable operation of the dredges is within the old channel, south of the present channel created by dredging operations of the two companies.

The field office of Yuba Consolidated Goldfields is at Hammonton; George J. Carr, superintendent. Hammonton is a village of 600 population, and containing 55 buildings, including dwellings, boarding houses, store, postoffice, repair shops and offices, all built and owned by the company. Employees are charged nominal rentals, and furnished light and water.

The Marysville Gold Dredging Company field office, construction and repair shops, hotel, clubhouse, postoffice and 16 dwellings, built and owned by the company, form the village of Marigold. The company is establishing also a farm and dairy for supplying the workmen. The tenants are charged a nominal rental and furnished light and water. Passenger travel is by stage between Marysville and Marigold and Hammonton.

Assisting the Débris Commission

Both companies operating in Yuba basin work in conjunction by contract with the United States Débris Commission in the construction of training walls describing the new channel of the river. Two parallel walls have been constructed of tailings, 30 ft. wide at base and an average of about 35 ft. high, for a length of about 2 miles, forming a channel three-fourths of a mile wide. The southerly wall extends from a point at the westerly end of Daguerra point cut, opened by United States engineers, in the northwest corner of S. 32, T. 16 N., R. 5 E. in a southwesterly direction to the northerly end of the original State dam site.

This southerly wall and the unofficial extension of it in an easterly and southerly direction from Daguerra point forms the northerly boundary of the dredging fields. The State dam has been extended northwesterly by tailings of the Marysville Gold Dredging Company, and this company has built also the westerly wall of the Government settling basin, being obligated to complete a contract made by its predecessor, though at an economic loss through necessity of moving the dredge in following up the line of the Government engineers, and a sacrifice of dredge No. 2, which was dismantled in 1909. This wall has a length of about two miles, and is 30 ft. high; but the settling basin has no value and has not been completed since the construction of the training walls obviated the necessity for its completion and maintenance. The Yuba Consolidated Goldfields was more fortunate in its contracts, as the work has been entirely on the training walls.

American River Division

The Natomas Consolidated of California and the Ashburton Mining Company are the active operators in the American River division. The Natomas has eight boats digging, on both sides of the river, the Ashburton has one boat on the east side of the river, one mile south of Folsom. This company has about 200 acres of its initial holdings to be worked out. There are other dredging lands in this division held by small companies, and one dredge is said to have been contracted for. The Natomas Consolidated active work covers at present about 5000 acres.

In 1909 and 1910 the Natomas Consolidated operated seven dredges, four of which were taken over from the Folsom Development Company at the time of the organization of the present consolidation of properties on the American and Feather rivers. The names of the Folsom boats were changed to Natoma and followed, in numerical designation, Natoma 3, commissioned in 1908, which was the third and last built by the present company until the construction of Natoma No. 8 which was designed and constructed in 1910 and put in commission in Jan., 1911. The numerical order of the designation of these dredges does not correspond with the order of their commission. The order of their commission stands: Natoma Nos. 1, 2, 3 and 6 in 1908; Nos. 4, 5, 7 in 1905; No. 8 in 1911. Two new boats, Nos. 9 and 10 are now in course of construction.

In this fleet in operation the boats are equipped with buckets of varying capacity, from 8 to 15 cu.ft. The smaller dredges have a capacity of 75,000 to 150,000 cu.yd. per month; the larger boats 200,000 to 300,000 cu.yd. per month. At installation all these dredges except No. 8 were equipped with shaking screens; Nos. 5, 6 and 7 have been changed to revolving screens. In 1905 and in 1908 the operators believed that the shaking screen was the economic method, but later experience proved the error. The substitution of the nozzle for the spray pipe has been applied to only one of the old boats, No. 6, but the new boats, Nos. 8, 9 and 10 have the nozzle washer. It is claimed that in some parts of the fields there is too much clay in the gravel to allow proper and thorough washing with the nozzles, while in other parts the nozzle is satisfactory. There is no complaint among independent operators of inefficiency of the spray pipe.

Dredges Nos. 1, 2 and 3 are equipped with General Electric motors; Nos. 5, 6, 7 and 8 with Westinghouse machines. The total power on the old dredges ranges from 415 to 790 h.p. Nos. 8, 9 and 10 have each a total of 720 h.p., with added 250 h.p. on Nos. 8 and 9 for the monitor pumps.

The Ashburton Mining Company, operates Ashburton dredge No. 2 at Folsom, a 7-cu.ft., single-lift, close-connected bucket, Bucyrus type, Westinghouse motors, digging about 28 ft. and outputting about 70,000 cu.yd. per month. The total output for the division since the installation of dredge No. 8 by the Natomas Consolidated is about 1,000,000 cu.yd. per month.

The division office of the Natomas Consolidated for the American river is at Natoma, a town on the Southern Pacific, served by steam and electric trains and automobiles. The repair shops, office buildings and about 25 dwelling houses and boarding houses are owned by the company, and a nominal rental charged to employees who live in the town. There is a post office and a railroad station also. C. N. Derby is division manager.

Natomas Reclamation Project

Natomas Consolidated operates also two rock-crushing plants on the American River fields, and one at Oroville. The land department of this company operates a reclamation project both on the American and the Feather rivers, though on a smaller scale at Oroville than in the vicinity of Natoma. Electric power for dredges in American River division is furnished by Western States Electric Power Company, and Great Western Power Company. The power plant of the former is on American river, near Placerville, and the power plant of the latter is on Feather river, 35 miles north of Oroville.

Monitors at Rebel Hill

The interesting feature of dredge operation in the Natoma fields is at Rebel hill, situated on the north side of American river. This hill covers an area of about 1200 acres of partly cemented and more compact gravel than is found elsewhere in the division. The depth of this gravel ranges from 45 to 75 ft., and for an average depth of 25 ft. requires breaking to reduce it to a mass that is economically dredgeable. This was accomplished in 1905 with No. 5 dredge, an especially designed 9-cu.ft. Bucyrus-bucket boat, equipped with two monitors having 3-in. nozzles. The monitors are driven by two 50-h.p. Westinghouse motors. The digging-ladder motor of 150 h.p. was displaced by a 200-h.p. motor, and a revolving screen substituted for the shaking screen, after the dredge had been in operation long enough for practical test. No. 8 dredge, which began operation at Rebel hill last January, is also equipped with monitor. This equipment comprises a 12-in. pump with 3-in. nozzle, under 200-ft. head, capable of delivering 3600 gal. per min., driven by a 250-h.p. Westinghouse motor. No. 9 dredge, designed for commission in July, is also equipped with monitor, and is to be operated about one-fourth mile distant from No. 8, at Rebel mine. The yardage output of No. 9 dredge is 130,000 cu.yd. per month, and the boat was digging 60 ft. in June. No. 8 was digging 58 ft., though capable of 65 ft., and was outputting 500 cu.yd. per hour, or 100 cu.yd. less than capacity.

Steel Hull for Tight Digging

Sulkey flat, south of the river and near Rebel hill, contains a similar aggregation of gravel, partly cemented and tight, requiring the special hull equipment of No. 6 dredge, which has no monitors. Humbug hill, situated south of the town of Folsom, and on the east side of the river, will present another interesting feature of economic dredging in tight gravel, when dredge No. 10, now in course of construction, shall be in full operation in the last of December or the first of January. The gravel at Humbug hill is similar to that at Rebel hill. No. 10 dredge is not to be equipped with monitors for breaking, but will have a steel hull, and be especially designed to withstand the strain of tight digging 65 ft. below the water line with especially strong 15-cu.ft. buckets, and a yardage capacity of 300,000 cu.yd. per month. This is the first dredge to be equipped with steel hull, and is likely to be followed by others for operation in similar physical formations, or where the life period of gold dredges should be extended beyond the possible lifetime of the wooden hull.

Dredges Nos. 5 and 6, which are still in good form and doing excellent work, are of the California type, built by the Bucyrus and the Western Engineering company for the Folsom Development Company, and are the last of the boats operated by that company. Since the succession of the Natomas Consolidated the dredges have been built by the Yuba Construction Company.

Summary of Equipment and Yardage

Of the 61 dredges in California fields in the first half of 1911, 34 were operated by 25 companies or individuals; 27 were operated by the three companies representing the W. P. Hammon interests, Natomas Consolidated of California, Oroville Dredging, Ltd., and Yuba Consolidated Goldfields; Newton Cleveland, general manager, Alaska building, San Francisco. There is a common impression that the Hammon companies operate or control a greater proportion of the dredging interests than is represented by these figures. As compared with other operators, the combined Hammon interests own and operate 53.7 per cent. of the active dredging ground, but the yardage capacity of the dredges of the three companies is equal approximately to 61.7 per cent. of the monthly output, estimating the total at 4,000,000 cu.yd. per month for the entire State. The yardage value, on a basis of $4,000,000 total production for the first half of the year, equals 16.7c. per cu.yd. as an approximate average for the State.

State Leased Prospecting Drills in New Zealand

The Mines Department of New Zealand has a unique method for aiding prospecting. The department has three diamond drills and one Keystone driller, which may be leased on the following conditions: The lessee must take delivery of the plant at any place decided upon by the minister of mines. In addition to making a deposit of £50, the lessee must furnish bond and security for the payment of all charges and the proper observance of all conditions. All damages to the plant outside of reasonable wear and tear must be paid by the lessee. A superintendent appointed by the minister of mines has sole control of the plant and the workmen employed, and the lessee must comply with his requests regarding the housing and care of the plant. The salary of the superintendent is paid by the department in the first instance, but is recovered from the lessee in monthly instalments. The lessee must pay the cost of all carbons used in boring and all working expenses of the plant.

Subsidies have been granted by the state to assist parties of miners prospecting for gold in districts recommended by the inspector of mines and the government geologist. During 1909 the sum of £4936 was thus expended in the various mining districts.

A Journey Across South America—I

By F. Glaizot*

Observations made while working in Bolivia and on a trip from LaPaz to Para, Brazil, by way of the Andes and the Amazon. Detailed accounts of a little-known region and its mines.

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NOTE—Translated by Mark R. Lamb from *Bull.* Soc. de l'Ind. Min., July, 1910.

This communication is the result of studies which I have made during a sojourn of nearly four years in the Bolivian cordillera of the Andes, where I managed tin and bismuth mines. During that period I visited the majority of the mineral deposits of the high Bolivian plateau, returning to Brazil part of the way by the torrential rivers which flow from the Andes, at other times following almost impassable trails through virgin forests. In those countries so difficult of access, where unhealthful climate and the elements are such obstacles to progress, I saw but few mineral deposits and no important developments, the latter due to the great labor and transportation difficulties. This contribution is in two parts: In the first I offer a geographical glimpse with some details of methods of communication, labor and fuel, then I will follow with some geographical notes covering Bolivia and that region in general.

THE MINES OF BOLIVIA

Bolivia is made up of two absolutely distinct regions; the high plateaus, and the plains which form a portion of the basins of the Amazon and the Rio de la Plata. The high plateaus are inclosed between two cordilleras (the eastern and the western), and the altitude of about 12,300 ft. renders the climate cold and severe and makes agriculture difficult; but the population is concentrated on these plateaus as a result of relatively easy transportation and intercourse over the lightly rolling hills, as well as on account of the working of the ancient mines on the spurs of the cordillera. During the winter nights the temperature frequently drops to 5 deg. F. During the day time, on the contrary, the pure rarified air permits an easy passage of the sun's rays and the temperature rises to from 50 to 68 deg. F. During the summer or rainy season the humidity of the air slightly reduces the variations of temperature. The region of the plains, where the tropical heat is not tempered by altitude, extends from the eastern range of the cordillera to the boundaries of Brazil, Paraguay and the Argentine. It starts from an intermediate point on the flank of the cordillera, where the rivers are almost constantly torrential—a region called *yungas* by the natives. It extends as immense plains which are cut by innumerable streams.

The *yungas* are fertile and have a temperate climate, but the difficulties of transportation in these steep regions have prevented the agricultural development from becoming important. The population also is less dense than on the high plateaus. Mines are rare and are mainly in auriferous alluvia. The plains region, which alone covers two-thirds of the area of Bolivia, has not been explored until recently. Even yet many regions are unexplored and some are in the hands of savages. Outside of certain centers, the region is thinly populated. This region forms the basins of the upper Madeira and the upper Paraguay rivers. The capital of Bolivia is Sucre, but since the revolution of 1900 the seat of government has been at La Paz, which city, notwithstanding its altitude of 12,000 ft., has developed considerably and has become the commercial and the industrial center of the country.

BOLIVIA'S EXTERNAL COMMUNICATIONS

I will make only a brief enumeration of Bolivia's external transportation lines. The railroads already built as well as those merely projected all have La Paz as a terminus. La Paz is connected with Peru by the Guaqui and Mollendo railways; with Chile by the Oruro and Antofagasta railway. The line from La Paz to Corocoro and Arica is under construction. The railway which will connect the Argentine and Bolivia has already reached the frontier at La Quiaca. And lastly, La Paz will be connected by rail with Cochabamba, Potosí, Sucre and the valley of the Madeira. The high plateau region is provided with plenty of good cart roads, but communication with the Atlantic side of the range is over mule trails which leave much to be desired. Mules, asses and llamas are used as pack animals. The latter can only with difficulty carry loads of more than 65 to 75 lb. Transportation across the plains region is chiefly by water, either on rafts or large canoes and sometimes on small, flat-bottomed steamers. Communication with Brazil follows the Acre and the Madeira river, the greater portion of the traffic following the latter. At Santo Antonio, unfortunately, it flows over a series of rapids which obstruct navigation. At the present moment, Brazil is building a railway from Santo Antonio along the Madeira and the Mamoré past the last rapids at Guayara-Mérim. This line will provide transportation under less difficult and dangerous conditions.

BOLIVIAN LABOR CONDITIONS

In the mining regions near the cordillera the labor consists of the Indians (Aymarahs or Quichoas), half-breeds or *Cholos*, and a few foreigners, principally Spaniards. The Indians are to be preferred to the mixed breeds for mining work, in spite of statements to the contrary. The halfbreeds are more intelligent but they are terribly addicted to drunkenness. The Indians are less exacting and, considering the altitude, do an amount of work which Europeans could perform with difficulty, if at all. The scarcity of labor, without being excessive, is a sufficiently difficult obstacle to be surmounted in the working of mines. In comparing the various classes of workmen, the following will show the wages paid, taking the monetary unit of the country, the *boliviano* as being worth 40c. in American gold: Ordinary labor (*peones*), $0.40 per day; miners, $0.80 to $1; retaining-wall builders, $0.80 to $1; concentrators, $0.60 to 0.80; women ore sorters, $0.30; women ore washers, $0.40 to $0.60; mechanics and blacksmiths, $1.60 to $2; stone and brick masons, $1.60. The mechanics and blacksmiths are usually half-breeds, rarely Europeans. The masons are all Indians. Many among these two classes of labor are good workmen.

FUEL SUPPLY

The fuel problem is a difficult one to solve on the high Bolivian plateaus on account of high freight rates. Coal sells for $80 per ton. Wood is dear in spite of the proximity of the virgin forests on the eastern slope of the royal cordillera. The principal fuel is *taquia*, the dried excrement of the llama. A turf found near the glaciers is also used as fuel as well as a kind of resinous moss, a toadstool-like fungus, found on the slope of Corocoro. The small quantity of low-grade coal which is mined near Titicaca has no effect in reducing the selling price of the above-described fuels any more than do the petroleum deposits which are being exploited in the same region but in Peru. The plains region could furnish an abundance of fuel in the form of wood and charcoal, so the importance of the projected railway which will connect the high Bolivian plateau with the valley of the Madeira is apparent.

THE GEOLOGY OF THE REGION

From a geological point of view also, two distinct regions may be considered—the high plateaus and the tropical plains. I will not here dwell upon the folding of the earth's crust which formed the chain of the Andes. This folding has, in Bolivia, caused the formation of two principal anticlines which constitute the two cordilleras, eastern and western. A se-

ries of lacustrian sedimentaries, the materials of which are the result of erosion on the flanks of the cordilleras, were deposited between the two ranges. This region is now the high Bolivian plateau, the lower parts of which are covered by lake Titicaca and lake Poopo. The eastern cordillera, the granite summits of which often pierce the Silurian schists and tower over the plateau region, their peaks reaching an elevation of 22,000 ft., rise suddenly, and on the Atlantic side, glacial erosion and that due to surface waters have carved out abrupt channels which often have vertical depths of hundreds of meters. The ancient schists, having been greatly distorted by the last folding of the earth's crust offer little resistance to the action of the surface waters, and it is for this reason that the flow in the region of the cordillera and to the foot of the range has cut down, little by little, through the places offering the least resistance, thus forming a narrow, walled-in channel which as it gains in depth increases the effect on the surrounding schists. Thus was formed the cañon of the La Paz river, at the foot of Illimani. In that region the waters flowing from the western side of the Cordillera Real followed two directions, part flowing to Titicaca which discharges into Poopo through the Desaguador river. The water flowing into Poopo is lost in an immense salt and borax gravel plain and its final destination is not definitely known.

The other waters, on the contrary, flowing from the region around La Paz, from Illimani and from Quimza-Cruz, flow into the valley of the Chacaltaya and the La Paz rivers, and we have the remarkable spectacle of a river formed on the western slope of the Cordillera Real at an altitude of about 15,000 ft., at the Chacaltaya glacier, afterward crossing that range through a narrow cañon 30 ft. wide at the foot of Illimani, which has an altitude of more than 20,000 ft. The plains region is an immense alluvial basin out of which rise the recently formed hills, as well as the remains of a range of earlier formation. A recent disturbance has given rise to series of low hills, which extend entirely across western Brazil with an east-west strike. Hardly noticeable at the Purus river, this fold traverses the Madeira, Tapajos, Jingu and Tocantis rivers, being the cause of rapids in each of these streams. The effect of the streams on this barrier has been to cut away the schist and expose the granite croppings which are themselves occasionally cut deeply, as at Girao and at Santo Antonio.

Rainfall

The plains region is more favored in the matter of atmospheric precipitation than are the high plateaus, and going on further to Peru, passing the western cordillera, one arrives on the Pacific coast, a region where rain has been entirely unknown for many consecutive years. The Cordillera Real forms an effective barrier against the moisture-ladened winds, which start from the plains region; the clouds which reach the glaciers are cooled by the contact, and whatever precipitation takes place on the western side of the range is usually in the form of snow. A part of the snow which falls on the Bolivian plateau is brought by the northeast winds, which manage to get through the passes of the east range, while the western cordillera forms an insuperable barrier for these humid winds, from all of which results the dryness of the Pacific coast. On the other hand, much of this wind cannot pass the eastern range and is turned from its course. The meeting of this cooled air with the clouds, which continue toward the south, results in hurricanes and abundant rains. This is also the origin of the cold wind called *surazo*, which makes itself felt along the length of the Beni and to some extent on the Madeira. At Villa-Bella I have seen the temperature fall from 86 deg. F. to 54 deg. F. as a result of the *surazo*.

Erosion Phenomena

Ample indications of the erosion which took place in former ages are found on the flanks of the Andean cordillera, testifying to the importance of the part played by the ancient glaciers. There is a series of amphitheatres, of which the highest still serve as beds for the surrounding glaciers, which form a suecession of steps where small and rather deep lakes are generally found. The peculiar formation of the floor of the valley is one of the plain indications of glacial erosion. Then, too, the U-shape of the walls of these amphitheatres, as well as the polishing of the quartzite which forms the bed rock in places, indicates clearly the work accomplished by the pebbles and boulders embedded in the glaciers. Remarkable effects of erosion, as well as deposits due to torrential streams and rivers, are frequently observed.

The valley of the La Paz river presents curious erosion phenomena. Sometimes one sees a veritable ruined city, consisting of columns and pyramids surmounted with boulders. On the banks of the cañon are "giant's kettles," where the current is sometimes slower, as a result of the river washing away the banks during high water. Further down, the cañon widens to two miles in places, and it is in such places that the fine material is deposited after a rise. On the east side of the range, the rises of the rivers are constantly modifying the river beds. For example, in the case of the Beni river, it may happen that during a single season branches of it may entirely disappear, the stream crossing the bed of such a branch at right angles in the middle of the former bend in the river. Again, where the accumulation of tree trunks and other water-carried débris obstruct its bed, a river will find or make a new course. A large number of lakes or *curriches* are usually found a short distance from a stream, which evidently are the remains of former arms or trenches of the river. Croppings of laterite are found all over the region of the *yungas*.

The violent winds which are almost continuous in the high plateau region, give rise to remarkable effects in the shifting of sand and dust. The result is usually the building up of dunes. On the foothills of the Andes the constant variations of the winds produce quite irregular and unimportant dunes. It is not the same, however, on the vast plains of Oruro, remarkable for their mirages. The winds there produce veritable mountains of sand, shifting then on in the wind's direction, the dunes being cut and changed by the same winds which form them.

The Mines of Bolivia

The mines of Bolivia are found almost entirely on the foothills of the Cordillera Real or on the high plateau. The fractures resulting from that gigantic folding of the earth's surface have nearly all been filled with metalliferous veins. The rock, as exposed and cut by erosion, lends itself more kindly to prospecting than does the tropical region, which disappears under an impenetrable forest, where it is difficult to see anything but alluvia—usually auriferous. Bolivia contains a large variety of minerals. Gold and silver mines were for a long time its principal source of mineral wealth. At present copper, and comparatively recently tin, are being prospected for and mined. And finally, Bolivia can be compared favorably with other countries which produce bismuth. Besides the above mentioned principal minerals, there are known deposits of wolfram, antimony, lead and zinc, but these are not worked extensively on account of their low grade. Rock salt and borax, as well as oil deposits, are known. The latter are situated in the plains region and are not yet developed.

Gold in Bolivia

Gold is found in veins and in alluvial deposits. The veins are the less important. They are found usually in the foothills of the cordillera. The principal ones are those of Choquettanga, in the district of Quimza-Cruz, where the gold is found free in quartz and also with sulphantimonates. The Suri veins, situated much lower, contain the gold principally as the native metal. At Chunganmyo, on the contrary, the gold is found chiefly with arsenical pyrites. Descending to the plains region of Brazil, one sees the veins of the Riberao river (a tributary of the Madeira) and the famous old mines of Matto Grosso, near Itenez.

These mines have been entirely abandoned, following the appearance of the terrible malady called *corrupcion,* which has completely depopulated that region. These veins generally are developed little, owing to the difficulties of access and of climate. The alluvial are the more important, but at least at present the same difficulties oppose all industrial enterprises. The riches accumulated in the valleys of the tributaries of the Amazon will not be profitably exploited until transportation is better developed.

The Alluvial Deposits

The most famous alluvial deposit is the one at Tipuani. It was first worked by the Incas and was taken by the Spaniards in 1562. It was studied several years ago by M. Bel, who has prospected the entire region. It will be sufficient for me to say that these deposits consist usually of a bed of red clay and rounded pebbles with fragments of quartz and schist, under which is found a 2-ft. bed of auriferous sand, called *venerille,* resting on a false bedrock of rounded pebbles. A similar formation is found under this false bedrock, but, at least during recent explorations, the true bedrock has not been found. I have found the same formation at Chivoy, on the Alto Beni river, but this appears to be a deposit of less importance. Down the river from Tipuani at Mayaya, on the Kaka river, the Incahuara Dredging Company is preparing to install a dredge for working the Makiki pampa, as well as all of the bed of the Kaka river, if possible. The transportation of this apparatus will reach a high figure, because it is necessary to effect it by means of rafts, which are frequently wrecked. Moreover, the auriferous deposits are covered with more recent deposits, containing tree trunks, which will make dredging difficult. And, finally, the torrential habits of the Kaka river make it dangerous for a dredge to be near it during the rainy season. The valley of the Kaka was prospected long ago by M. Armas. The Songo and the Coroico rivers also contain auriferous alluvia, which are also difficult to work.

The alluvial deposits of Quimza-Cruz are simply washed in *bateas* by a small number of prospectors. The same may be said of the Challana and the Collana deposits, which are now in the hands of rebelling natives. The Cajones river, a tributary of the Wopi, is the site of small workings conducted along primitive lines, but with good results. The La Paz region was formerly the site of many gold workings. The river is called Choqy-Yapu, meaning "river of gold." The only work now being done is on the Chuquiaguillo river. The deposit is similar to that of Tripuani. The material is washed and the gold is caught by amalgamation, the tailing being treated on Ferraris tables. Since perfected methods of treatment were adopted, the grade of this deposit has lowered. To the north of La Paz, and at the foot of the Huayna Potosi mine, are the alluvia of Japa-Jopo and of Vilaque, in which the gold is mixed with many other metals. The amount of gold extracted increased up to the period of the occupation by the Spaniards, but at the present time these deposits are abandoned. The plains regions are rich in alluvial deposits. I will cite among such only that of San Martin, near the Baures river, a tributary of the Itenez, which appears to offer possibilities of profitable exploitation, if it were possible to overcome the difficulties of temperature and labor supply.

Bolivian Silver

During many centuries the silver mines of Potosí were the most productive in all the world. They have produced more than 6,000,000,000 francs worth of silver. The town of Potosí, which has grown up near the mines, had at one time more than 100,000 inhabitants. Up to the time of the war for independence, all the moneys of the Spanish colonies were minted there. The silver veins cut Mount Potosí, which is a quartz-porphyry intrusion, which rises through the Silurian schists. Now tin has come in place of the silver. It is the same at Oruro, where the San José mine is the only one supplying an important tonnage of silver ore. The Oruro district comes immediately after Potosí as a producer of silver. I will take up these two regions later in the special study of the tin mines of the districts. The same decrease of silver content is noted in the ore from the mines of the Compagnie Francaise de Huanchaca, where the fissures are in partially decomposed trachytes. This mine has furnished a large tonnage of silver ore. The company built the first railway in Bolivia, from Antofagasta to their mines, for transporting the ores to its Playa Ancha smeltery, situated on the coast near Antofagasta. At present the ore contains chiefly blende and pyrite, with a little argentiferous galena and copper.

The Pulacayo reduction works consists of a large sorting floor and a concentrator equipped with: Two Blake crushers: two sets of crushing rolls; one belt elevator; eight trommels; 12 five-compartment jigs; six Ferraris concentrating tables; four Veyan slime tables; one round table for slime; three Kauffmann producer-gas roasting furnaces; six magnetic separators. The sorting produces a galena containing 32 per cent. of argentiferous lead, and a blende containing 40 per cent. of zinc. The jigs separate the galena, then the pyrite containing blende and a little silver, which is afterward magnetically concentrated, and lastly a product consisting mainly of blende. The magnetic concentration gives a blende containing 40 per cent. of zinc and a little silver, and oxidized argentiferous pyrite. The special rates which the company has maintained on the Antofagasta railway permits the shipment of all of these products in spite of their comparatively low grade.

The reduction works is provided with an electric plant which is probably the largest and most modern in South America. The power is conveyed 60 miles from the Caua valley, near the Yura river, by a canal and a 20,000-volt transmission line. The plant was required principally for pumping out the mine which has reached a depth of 2000 ft. Outside of these principal districts there are numerous undeveloped argentiferous-galena veins, and many old Spanish workings which the increased cost of labor has made unpayable.

Copper and Bismuth

The Corocoro region has been vigorously developed for a long time. The deposits from which native copper is produced closely resemble those of the Lake Superior region of North America, and the Bolivian deposit undoubtedly has a similar brilliant future before it. The ore occurs in beds in the Permian sandstones. Up to the present the mines have been worked unsystematically. A French syndicate (Corocoro United Copper Mines) has just combined the four principal mining companies and is about to modernize the methods of development in order to obtain better results. Systematic prospecting has been started with the result that beds hitherto undeveloped have been discovered. In 1906, at Callapa, south of Corocoro, work was begun on beds which appear to be the extensions of the above described deposits. These are now being worked by the Gran Poder de Corocoro company.

The principal deposits of bismuth are those at Huayna, Potosí, Tazna and Chorolque. Bismuth occurs as metallic bismuth and as bismuthine. It is always accompanied by tin. Beautiful crystals of native bismuth have been found in the contact between schist and quartz-porphyry at Huayna Potosí. The formation at the other two mines is the same. The mine at Chorolque, the highest in the world (18,000 ft.) is also the greatest producer of bismuth. The only bismuth smeltery in the republic is the one at this mine.

Promising Tin Deposits

Outside of the departments of La Paz, and of Oruro, whch will be taken up in detail later, tin occurs at Potosí, Tazna, Chorolque and Uncia-Llallagua. The Potosí output of tin, while it has not reached the silver production, is nevertheless important. Cassiterite occurs in compact masses in what were formerly the silver

veins. It is also found mixed with pyrite. The distance of the mines from the railway makes transportation expensive. For this reason it is preferable to smelt the tin to bars to reduce freight charges. The projected railway which will pass near Potosí will be a boon to that remote district. Besides the tin veins, some stanniferous placers are worked. At Tazna and at Chorolque the tin is associated with bismuth. Chorolque has a tin furnace in conjunction with its bismuth furnace.

The Uncia-Llallagua deposits are similar to those at Huanuni which will be discussed later. The veins are in a rhyolite intrusion. I would call special attention to the little Uncia mine, covering 10 acres, which after having for a considerable period produced exclusively sulphide ores, has for several years produced an abundance of oxidized ores. Taking into consideration its poor surface showing, this is the best producing mine in Bolivia. The works at Uncia consist of: One 90-h.p. gas engine; one 60-h.p. steam engine; two 25-h.p. petroleum engines; four ball mills; 10 Ferraris and Wilfley tables; mechanical jig and revolving tables.

The Tin Mines of La Paz and Oruro

The tin deposits of La Paz and Oruro occur in the foothills of the Cordillera Real, generally on the west side (except the Potosí deposits). They seem to be connected in some way with the folding of the earth's surface which resulted in the formation of the cordillera of the Andes, and are nearly all above 13,000-ft. elevation. There are three kinds of deposits; veins in fissures, contact beds and alluvial. The latter are comparatively rare; and it has been difficult to make a profit in operating even the few which have been worked. The deposits most frequently developed are the veins. The fractures have taken place either in the schists or in the quartzite. The veins are generally regular and extend for a long distance. Sometimes they form compact bunches which afterward split up and form veritable *stockwerke* of which the component veins are not payable on account of their low grade. The important fractures are generally parallel to the line of folding.

The tin veins vary in width from 18 in. to 75 ft. They are sometimes filled with detrital sediments which were caught at the time of the formation of the fractures, and are frequently filled with calcite. The cassiterite occurs in crystals of varying dimensions, often forming masses which, in certain cases, reach a thickness of 18 in. Often it is intimately mixed with pyrite. The tin may also be associated with various other minerals and metals such as galena, blende, wolfram, stibnite, chalcopyrite, bismuth, metallic bismuth and the chlorides and sulphides of silver. The tin veins for the most part present the following characteristics.

At the outcrop the cassiterite is found in large crystals, in compact masses and in beds, all in white and iron-stained quartz with traces of the iron cap which covers the deposit. Often the cassiterite is also found deposited on a bed of white or ferruginous clay or incorporated with it. This clay contains small crystals of quartz. They seem to have originated as a result of the kaolinization of the feldspar of the granite which accompanied the veins. This white clay is called *llampu*. It is only necessary to subject this clay to a light washing to obtain a concentrate containing 60 per cent. or more of tin.

Veins of Stanniferous Pyrite

As the veins are opened to depth the stanniferous pyrite appears and with its appearance and with increasing depth the per cent. of tin in the ore decreases. Sometimes, on the contrary, an appreciable enrichment of the ore takes place as depth is attained, as for example at Uncia. But this enrichment is due to outside agencies and has nothing to do with the vein formation. As a matter of fact, the snow water can filter into the interior of the veins on account of the faults or fissures, dissolving the pyrite and decomposing the quartzite which, being deprived of its tin by the mechanical action of the water, permits the cassiterite to sink through it toward the foot-wall. This action of the surface water serves also as a guide in the search for rich pockets of tin.

For example, when a drift is seen to be coated with a deposit of iron oxide, sometimes in stalactite forms, it is certain that the cassiterite will be found below, concentrated spontaneously by the water. This flow of water has often formed large chambers or *tambeos*, lined with iron oxide and from which the tin has been carried much further down. This iron-oxide coating is itself tin bearing, and often is a mineral which can be profitably worked, it being possible to concentrate it without roasting as is required when treating pyrite. One of the immediate results of the action of the water on the vein matter is the formation of sulphate of iron which may be accompanied by sulphate of copper due to the presence of veinlets of copper in the deposit. This acid water is recognized by the Indian miners who call it *copajira*. It flows and drains to the lower tunnels where it is impossible to use iron rails on account of the rapid corrosion.

Mine Development

The mines are usually developed through adits. These connect with each other through raises which permit handling the ore by gravity. Some mines unfortunately have retained the bad Indian or Spanish system of starting development, consisting of opencuts following with a series of inclined shafts or *piques* which are extended as levels in the body of the vein. The mines are generally flooded by the melting snow during the rainy season, the opencuts and inclined shafts serving as catch basins for the water, the fissures conducting it to the interior of the veins and sometimes making all work impossible on account of the dangerous falls of rock. Moreover, the ancient miners did not extract any but the richest mineral, and filled their stopes with "waste" containing five per cent. and more of tin. This is still done when the mine is leased to contractors called *pirquineros* who are at liberty to mine as they please and are only required to sell their concentrates to the mine owner. The deplorable work of these *pirquineros* often necessitates heavy expenditures for putting the mine again in a condition to be worked regularly.

The simplest way to put such a mine in normal condition is to start new levels without disturbing the old workings, and to work out progressively the filling and the virgin ground. As wood is dear, it cannot be used for timbering and stone walls are substituted. Quartzite makes an excellent building stone, and the Indians are skilful in stone masonry and in the building of arched roofs. The ore is transported to the reduction works on the backs of asses, llamas or men, and in the larger works by means of aërial trams called *andarivels*, the works always being located lower than and in the immediate vicinity of the mines.

(To be continued)

The First Run with Lake Iron Ore

In referring to the death of John J. Spearman, the *Iron Trade Review* has compiled an interesting record of the first run of Lake Superior ore at old Sharpsville furnace in 1858. The furnace, built in 1846, was of stone, was 46 ft. high, bosh 10 ft. 10 in. by 7 ft., trunnel head 7 ft. across. Hearth was 6 ft. high, square work at bottom 4 ft. 6 in., circular work 4 ft. diameter, tapering outward to 5 ft. 3 in. at top. The ore was brought down the Lakes by schooner and to Sharpsville by canal, the first shipment received being one canal-boat load.

The record of the experimental run of six days, Aug. 1-6, 1853, shows: Coal used, 547,700 lb.; limestone, 46,190 lb.; local ore, 61,100 lb.; Lake ore, 249,100 lb.; iron made, 62½ tons. The coal used included 210,200 lb. used in starting the furnace a day before the test run began. For the last two days only lake ore was charged. The ore was from the old Jackson mine, the first opened in the region. The following weeks the furnace was in good shape and an increased production was made.

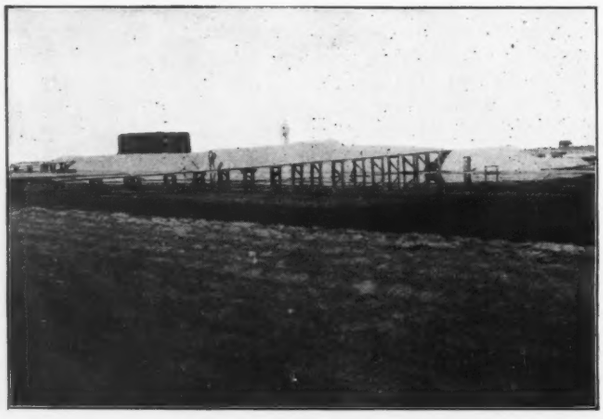
The Utah Solar Salt Industry

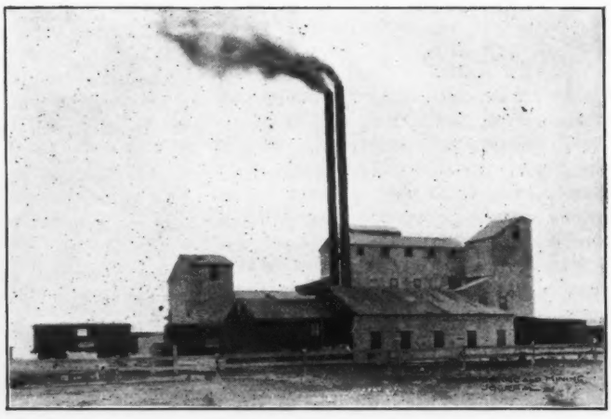
By Percy E. Barbour*

High salt content of the Great Salt Lake water, dry climate and high summer temperatures are favorable factors in the solar salt industry of Utah.

*Mining engineer, 366 Ninth avenue, Salt Lake City, Utah.

One of the important as well as one of the most interesting industries of Salt Lake City is the manufacture of salt from the waters of Great Salt Lake by solar evaporation. The lake has an average length of about 75 miles and a width of about 30, and has, therefore, an approximate area of 2250 square miles. These figures are necessarily only approximate, because the lake level varies greatly, not only from year to year, but from season to season. From the low point of 1903 to the high point of 1910, the lake rose 7.9 ft. The greatest fluctuation in any one year between these dates was in 1907, when the difference between high and low was 3.3 ft.[1] Owing to the flatness of the shores, which were the old lake bed, a slight change in water level makes a considerable change in the area. The lake is comparatively shallow, having a maximum depth of about 50 ft., and a probable average depth of about 15 ft.





UTAH SALT MANUFACTURE—STOCK PILES AND FACTORY

The density of the water depends, relatively, upon the water level, the lower the lake the greater the density. The specific gravity varies, as given by different authorities, from 1.111 to 1.17, with a probable average of about 1.15. The specific gravity of sea water averages 1.02. With the exception of the Dead Sea, Great Salt Lake is the densest known body of water. The water contains total solids varying from 15 to 22 per cent. by weight, and is, therefore, nearly five times as salty as the Atlantic Ocean. With this large salt content, and the elevation, 4213 ft. above mean sea level when the lake is at zero reading[1], and the natural aridity of Salt Lake basin, local conditions are unusually favorable to solar evaporation.

SOURCE OF THE LAKE'S SALINITY

The salt in Great Salt Lake is not due to salt beds underlying the lake, as is generally supposed by the tourists who visit it with so much interest, but is due to the fact that the lake, which is constantly being fled by numerous inflowing streams containing small amounts of saline matter, has no outlet and the rate of evaporation is high. The salinity of the lake is, therefore, the direct result of long continued natural concentration. Only one of the inflowing streams, the Malad river, contains enough saline solids to be brackish to the taste, although Professor Talmage says: "The streams . . . have traversed salt-bearing formations[2]." A complete analysis[3] of a sample of the lake water having a specific gravity of 1.156, gave the following results, expressed in grams per liter: NaCl, 192.860; K_2SO_4, 8.756; Li_2SO_4, 0.166; $MgCl_2$, 15.044; $MgSO_4$, 5.216; $CaSO_4$, 8.240; $FeAlO_3$, 0.004; SiO_2, 0.018; SO_3, 0.051; total, 230.355; total solids by evaporation, 238.120 grams per liter.

There are but two companies making salt from the lake at the present time. One is a small independent company, which ships all of its salt in the crude state. The other larger company is the result of combination of the several rivals into the Inland Crystal Salt Company, of which Joseph F. Smith, the head of the Mormon church, is president.

WATER USED, 7000 GAL. PER MIN.

The pumping season begins as early in the year as the weather will permit, generally about May. The brine is pumped from the lake, by centrifugal pumps, into a wooden flume about 8 ft. above the shore, through which flume it flows to the salt ponds two miles inland. The pumping is at the rate of 7000 gal. per min., during 10 hours per day, and it requires about 10 days to fill the settling pond to which the brine first goes. On entering these ponds, the brine averages about 17 per cent salt.

Here all the foreign matter, such as cinders from the railroad nearby, sand, etc., picked up by the pump from the lake, are settled out and the brine overflows to the stock ponds, having reached, due to evaporation, a salinity of about 22 per cent. during its passage through the settling ponds. It is in the stock ponds from three to 10 days, depending upon the weather, until the solution evaporates to 26 per cent. salt when it is drawn off into the harvest ponds and is there allowed to deposit. These ponds are first prepared for the salt crop by depositing a salt bottom or floor, on which the subsequent salt is deposited, so that the harvested product is perfectly clean. There are a total of 35 ponds, of about nine acres in each, in use, of which only 10 or 15 are generally harvested. The annual "crop" or deposit is from two to six inches thick, depending, of course, upon the weather conditions during the pumping season. In 1910 the summer season was particularly dry.

The mean temperature in Salt Lake City was 72.8 deg. F., and the mean relative humidity was 31.5 per cent[1]. Salt Lake City is a little higher, being in the foot-

[1]By courtesy of the local office of the U. S. Weather Bureau.

[2]"The Great Salt Lake," by Dr. J. E. Talmage. For complete data on Great Salt Lake past and present, see the monograph, "Lake Bonneville," by Carl Grove Gilgert, U. S. Geol. Surv.

[3]E. Waller in School of Mines *Quarterly*, Vol. XIV, p. 58.

hills, and a little cooler than the lake shores. During July the mean temperature near the shore, as recorded at the Garfield smeltery, was 81 deg. F., against 77.6, the mean for Salt Lake City. The 1910 crop was 5 in. Of this only 50,000 tons were harvested. The total acreage harvested was about 100, which gives a crop of 500 tons per acre. However, this was an unusual year; 250 to 300 tons per acre being an average crop. It is interesting to compare this with the French Atlantic fields which yield, from sea water, 0.6 to 11.1 tons per acre, with the French Mediteranean fields, which give 12.1 to 23.7 tons and the Corsican yield of 68.5 tons per acre[4].

Salt Lake valley is perfectly flat in the vicinity of these ponds, and their number could easily be increased to give ten times the present crop capacity, if the market demanded it, by constructing the simple dikes built of plank and filled in with dirt, which separate the ponds from each other.

Harvesting the Crop

The harvesting season begins in October. The mother liquor, amounting to nearly 10 per cent. of the inflow, is drained off and returned to the lake, thus removing most of the impurities, soda and magnesium compounds, contained in the original brine. Great care is exercised to prevent this soda from being thrown down, as it is much easier to remove it from the finished salt. The salt is now allowed to deposit and dry and then harvesting begins. The hard, level, solid mass, resting on salt floors previously laid down, is broken up with common plows drawn by horses, and is then stacked by means of scrapers and wheelbarrows into large piles of uniform size alongside the railroad track. The loss from these piles, due to rains during the autumn and spring dissolving the salt, amounts to 10 per cent. of the total harvest. This percentage is strikingly large, but has been carefully determined over a period of years.

The various ponds make various grades of salt due to factors which are not yet perfectly understood. The situation of the ponds relative to prevailing winds and the way the brine is flowed into the ponds seem to have much to do with the grade of the deposit. Only the highest grade ponds are harvested for refining to be used for table salt.

A railroad spur runs to the stock piles whence shipment is made of crude salt either to the market direct, in bulk, or to the company's mill on the shore of the lake 1.5 miles away, where it is manufactured or refined into various grades of table and dairy salt. The crude salt is claimed to be a purer salt than any refined salt made in this country with two exceptions. An analysis of an average sample of this crude salt made by Herman Harms, the Utah State chemist, showed the following composition: NaCl, 97.85 per cent.; KCl, none; $CaCl_2$, none; $MgCl_2$, trace; $CaSO_4$, 0.49; $MgSO_4$, 0.02; Na_2CO_3, none; Na_2SO_4, 0.06; Fe_2O_3, trace; Al_2O_3, 0.01; SiO_2, 0.07; $Ca_3(PO_4)_2$, none; moisture, 1.20 per cent.; water of crystalization and interstition, 0.30 per cent.; total, 100 per cent. The mill is new, having been built to replace the old one which burned in November, 1908, and is probably the most modern salt refinery in the United States. The salt is scraped from the railroad cars by mechanical scrapers into a bark crusher from which it goes to the boot of a bucket elevator and is elevated to a storage bin above the driers to which it is fed by Allis-Chalmers Challenge ore feeders.

Drying the Salt

As originally built, there were two driers each 100 ft. long, with six hearths along which the salt was moved by means of chain drag conveyers from one end to the other, dropping from one hearth to the next at the ends, so that the salt had a total travel of 600 ft. through the heat. Both direct and indirect heat were supplied, the former from steam coils in the drier itself and the latter from hot air delivered by fans and drawn through two hot-draft stoves located in the boiler house. A constant temperature of 210 deg. F., is maintained in the driers to drive off the moisture in the salt. Two 60-in. blowers for direct heat and four 45-in. blowers for indirect heat were used. Steam is furnished the heaters by two 100-h.p. boilers working under 150 lb. pressure. These driers have since been replaced by three cylindrical rotary driers built by the Hersey Manufacturing Company and developed along lines suggested by the salt company. The hot-draft stoves, of the regulation steam-coil type, receive their air supply from the hot air directly over the boilers themselves.

From the driers the salt is carried by screw conveyer to five sets of style A, Allis roller mills, such as are commonly used in flour mills, in which the salt is reduced to the desired fineness. Between the drier and the roller mills the salt is subjected to an air blast which removes any further impurities, such as soda, which were not drawn off with the mother liquor at the ponds. After passing the rollers the salt goes to three No. 6½ Allis-Chalmers bolters, also of the flour-mill type, and thence to the classified bins. It is now a finished product of the highest class and is ready to be sacked or boxed for the market.

Analysis of the Refined Product

The salt is drawn from the bins into the various sized sacks, the exact weight being gaged by an automatic weighing machine manufactured by the Hoepner Scale Company. The sack is then sewed up by a Union Special sewing machine. A chemical analysis by the State chemist of the company's product known as Royal Crystal table salt gave the following composition: NaCl, 99.43 per cent.; $CaSO_4$, 0.37; SiO_2, 0.02; $MgSO_4$, Na_2SO_4, trace; $MgCl_2$, KCl, $CaCl_2$, Na_2CO_3, $Ca_3(PO_4)_2$, $CaCO_3$, $MgCO_3$, $FeAlO_3$, none; moisture, trace; water of crystalization and interstition, 0.18; starch or other fillers, none; total, 100 per cent.

Large quantities of crude salt are sold to chlorination mills, especially in Colorado, although this trade is not as large as formerly, due to the declining use of the chlorination process in the treatment of ores. Stock or cattle salt is handled from railroad cars at the mill by scrapers, through crushers and elevators, exactly like those described in the other side of the mill and goes to bins from which it is drawn and sacked for shipment without further treatment. During the cattle season the shipments average over 15 cars per day.

This company also manufactures a patented stock salt particularly for sheep which both prevents and cures scab and blackfoot, scourges from which sheepmen commonly suffer severe loss. Pure sulphur, 2 per cent., is mixed with 98 per cent. ground dairy salt. This mixture is pressed into 12-in. blocks, in a hydraulic press, under 6000 lb. pressure per sq.in. The object of the sulphur is medicinal and by this method of mixing the exact dose required is easily fed. The advantage of pressing it into blocks is to prevent waste either by the sheep or by weathering.

Power Supply

Power to operate the mill is taken from the high tension line of the Telluride Power Company at 44,000 volts and is stepped down to 2300 and then down to 440 volts, the working voltage, by two banks of Allis-Chalmers transformers. The motor units are one 30-h.p. for the elevator, scraper and crusher; one 30-h.p. for the driers; one 5-h.p. for the small fan; one 75-h.p. for the rollers and bolters; and one 30-h.p. for the elevator, scraper and crusher for stock salt. The mill has a capacity of nine tons per hour and employs 30 men. I am indebted to Mr. Clayton, of the Inland Crystal Salt Company, for permission to visit the plant and for free access to its data.

Three gold mines in France are now producing steadily—the Lucette, the Bellière and the Chatelet. Prospecting is going on, with encouraging results, in the Limousin basin, in the departments of Creuse, Correze and Haute Vienne. The ores of the three mines in operation are mainly arsenical pyrites.

[4]Eng. and Min. Journ., Sept. 3, 1910.

Coal Mining Department

Washington Produces Coke

Washington is the only State west of the Rocky mountains that contains coal possessing coking qualities, and the coking industry of Washington is restricted to a limited area in Pierce county. Tests made at the experimental plant of the U. S. Geological Survey at Denver in 1908 showed that a fair quality of coke could be made from the coal mined in the northern part of the Roslyn field in Kittitas county (the only workable coal in Washington east of the Cascades), but so far no attempt has been made to coke this coal on a commercial scale. There are six establishments in the State and of these, only three, all in the Wilkeson-Carbonado field in Pierce county, made coke in 1909 and 1910.

The total production of coke in Washington in 1910, according to the U. S. Geological Survey, amounted to 59,337 short tons, valued at $347,540, against 42,981 short tons, valued at $240,604 in 1909. Both in quantity and value the production in 1910 exceeded all previous records. Compared with 1909 it showed a gain of 16,356 short tons, or 38.1 per cent. in quantity, and of $106,936, or 44.4 per cent. in value. The percentage of increase both in quantity and value was the largest shown by any of the coke-producing States in 1910. The larger relative gain in value, however, was more apparent than real, for of the total increase of $106,936 in 1910 over 1909, $96,161 was in the value of the coal charged into the ovens, and the net increase in the value of the coke was accordingly only $10,775, whereas the quantity of coke produced increased 16,356 short tons.

The coke industry of Washington began in 1884, when 400 tons of coke were made in pits. The first ovens were built in 1885.

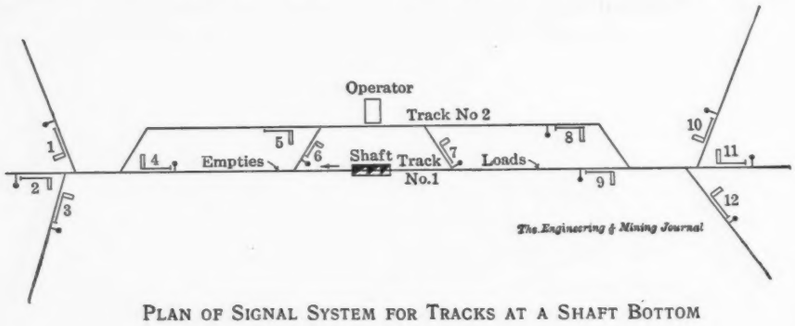
The equivalent of $7,000,000 United States Gold is employed in the coal-mining industry of Chile, which gives employment to 7175 men.

The Important News Of Coal Mining. New Appliances, New Methods. New Fields, Colliery Engineering

Block Signal System for Mines

By F. S. Foote*

The recent article in the May 13 issue of the Journal (p. 972) describing a signal system for the tracks at a shaft bottom, suggests a few points which may be mentioned. In the first place, a fundamental rule in signaling is to so arrange the apparatus that a failure of any part will display a stop signal, not a proceed signal. With the absence of a signal light indicating proceed, trouble in one of the circuits might put out the signal lamp and give a false clear signal. It would seem preferable to have a red light showing constantly at each signal point, with an additional lamp (white) which, when lighted up, indicates proceed.



Plan of Signal System for Tracks at a Shaft Bottom

Track Instrument Employed to Signal a Train to Proceed

The accompanying diagram is my suggestion for the signaling of this layout. This conventional sign for semaphore signal has been used for the sake of clearness, although in this case, of course, semaphores would not be used. Near each signal (except No. 5) is indicated a track instrument for sending an indication to the operator's cabin when a train approaches a signal, and desires permission to proceed.

*University of Illinois, Urbana, Ill.

The meaning of clear signals at the various points would be as follows:

At 1, 2 or 3—all clear to No. 5.

At 4—signals 1, 2 and 3 are normal, preventing the entrance of any train from the north end of the mine.

At 5—clear track to "loads" track by way of crossover past signal No. 7.

At 6—all clear to No. 8.

At 7—clear track to "empties" track by way of crossover past No. 6.

At 8—9, 10, 11, 12 are all normal providing a clear track for an outgoing train.

At 9—all signals are normal, giving the light engine (motor) a clear track for the run-around movement over full length of track No. 2.

At 10, 11 or 12—means 8 and 9 are normal, and there is a clear track to "loads" track.

The Locking System

To accomplish this the following locking would be necessary:

Clear	Locks
1	2-3-4
2	1-3-4
3	1-2-4
4	1-2-3
5	6-7
6	5-7
7	5-6
8	9-10-11-12
9	All signals
10	8-9-11-12
11	8-9-10-12
12	8-9-10-11

To provide this locking, three drums should be used in the controller, one for signals 1, 2, 3, 4, one for signals 5, 6, 7, and one for 8, 10, 11, 12. No. 9 is to be specially provided for.

The conductor on each drum should consist of a collar for the positive brush, with a short section projecting along the drum for making contact with one brush at a time only, such contact lighting the "go-ahead" lamp. Only one such lamp in each group could then be lighted at one time.

Details Explaining the Construction of the No. 9 Signal

For No. 9 signal, provide a short longitudinal strip of metal on each drum insulated from the conductor mentioned above. Two brushes side by side rest upon this strip only when all the other brushes are clear of circuit-closing contact. Carry No. 9 circuit through these three pairs of brushes in series, then No. 9 signal could be lighted up only when all other "proceed" lamps are dark.

The scheme here outlined does not provide enough signals for theoretically complete protection, but with a good man in charge there would be small chance of accident. Finally—such an installation is not properly block signaling but interlocking.

Panel System of Longwall Mining

By C. E. Krebs *

Details of a modified system of working longwall advancing, and particularly designed for use in thin seams such as those that will have to be worked eventually in southern West Virginia.

*Assistant State geologist, Charleston, W. Va.

NOTE—Paper read before the summer meeting of the West Virginia Coal Mining Institute, at White Sulphur Springs, W. Va., June 20, 1911.

The mining methods generally used in West Virginia in mining coal have been the room-and-pillar system which was probably adopted on account of its first low cost of development, and possibly also it was not expected to extract all the coal from the seam. This method has played havoc with many mines, and millions of tons of coal have been lost, that can never be recovered because of its use, or rather misuse. Then, too, it is true that thick seams of coal were the first mined where this method of mining was peculiarly fitted, but the thickest seams are being worked out very rapidly and thin seams of coal will have to be worked and at a minimum cost, so as to meet the competitive price of coal in the market.

To meet these demands, I will briefly discuss a method of longwall mining, which I believe, if adopted, will add materially to the solution of the question of first cost, maximum recovery of the coal, and minimum loss of life and property and with greater safety to those so employed in its use.

We are told by mining men coming from Europe, that longwall mining has long been successfully used in the mines of those countries and that it is now successfully employed there, but it appears the system used by them was the retreating system of mining and not the advancing.

In order to use the retreating longwall system as it is generally done, it will be necessary first to drive the main entries to the boundary lines of the leasehold before any results can be obtained. This operation is expensive and can only be done by the strongest and wealthiest companies. It also takes years of a small output to do this work, as only the entry coal is mined. This would naturally make costly coal during the development.

The system I propose is a plan which has been designed by the firm of Clark & Krebs, civil and mining engineers, of Charleston, West Virginia, about two years ago, and a description of which, as given in the diagram attached to this paper, is as follows:

DETAILS OF THE SYSTEM

The mine can be laid off in a general way, similar to that of an ordinary room-and-pillar working, that is, two or three or even a four main-entry system can be adopted with cross entries to the right and left having overcasts for the splitting of the air, and directing the current into these right and left cross entries.

These main entries can have from 20 to 50 ft. of a pillar between them, and then be protected by a barrier pillar on each side of them of a width of from 200 to 250 ft. The plan here shown in the accompanying diagram has a two-entry system with 50-ft. pillars between the two entries, and a barrier pillar of 210 ft. on each side of them. The cross entries are driven at intervals of 1100 ft. on the right and left.

The panel of coal to be mined will be a block of coal 480 ft. by 850 ft. These panels are worked alternately; that is, No. 1 Block on second left is being worked by starting two rooms off second left—1—entry and connecting with two rooms of the second left—2 entry. When this connection is made between these entries the panel is then ready to begin longwall mining. While 2 L-X block No. 1 is being worked, 2 L-X block No. 2 is not worked, but as soon as the 2 left X entries are far enough, then 2 L-X block No. 3 is worked. Thus No. 2 block is retained as a barrier pillar until Nos. 1 and 3 are worked out. The system can be pursued along this course until the property line is reached.

When the No. 1 and No. 3 blocks have been worked to the barrier pillar line, then No. 2 block can be worked. This block will have to be worked retreating, that is to say, the coal will have to be taken from the third left entry and hauled to the main entry.

The system can be worked on each side of the main entry, that is, on the right and left of same, as shown in the diagram herewith attached.

The diagram gives a general plan; but the measurement will have to be revised, and plan made to suit each individual seam, as local conditions will govern to a certain extent.

When the longwall system is being actually worked, the face of the coal will have to be undercut to a depth of from 5 to 6 ft. by a longwall mining machine, and this cut is cleaned out, while the cutting proceeds. In order to keep the coal from falling down in a solid block, stays can be inserted from 5 to 10 ft. apart. These stays can be made from timber from 4 to 6 in. thick, and must be removed before the coal is shot down.

The track is laid along the face of the coal and about 8 ft. from it. This will give ample room for the cutting of the coal, and when the cutting is done and before the blasting begins this track can be moved near the face of the coal. This track is connected on both ends to the track in the entries and curved rails are so attached that it can be easily moved, having also short rails from 4 to 10 ft. at each end so as to connect quickly.

Another important feature to be observed is the proper posting of the roof before blasting down the coal. At least three or more tiers of posts should be constantly kept set, but these will have to be regulated in different mines in accordance to the roof that is encountered. The main object is to hold the roof long enough until the coal has been worked out in advance enough, and then take out the posts behind so that the roof will be allowed to fall, and this relieves the excessive weight on same. However, at least three rows of posts should be left set at one time.

The coal can be hauled with gathering motors, having drums for their trolley-wire attachment from the cross entry, or trolley wires can be placed on the roof and moved from time to time as the track is mined. The system as proposed has the following prominent points in its favor:

ADVANTAGES OF THE SYSTEM

(1) *Ventilation*—The system is an ideal one for ventilation, and is well adapted to carry out the State mining laws to the letter. It is beyond question that good pure air is necessary for health and safety of a miner. By this system a current of pure air can be supplied along each working face, and the currents so split that only one panel need be supplied by the same current. It further complies with the mining laws, that less than 60 persons are on one split or current of air.

(2) *Safety*—Each panel is worked independent of the other, and in case of an accident, it need not disturb the other workings. Also each panel will be under the direct supervision of a competent and experienced mining man, possi' y an assistant foreman, who remains in the working place during the working hours and thereby lessens the chance for dangerous practices among the miners. It will also be much safer in blasting down the coal, since there will not be much danger of any "blowout shots." Furthermore, the blasting can be done at night

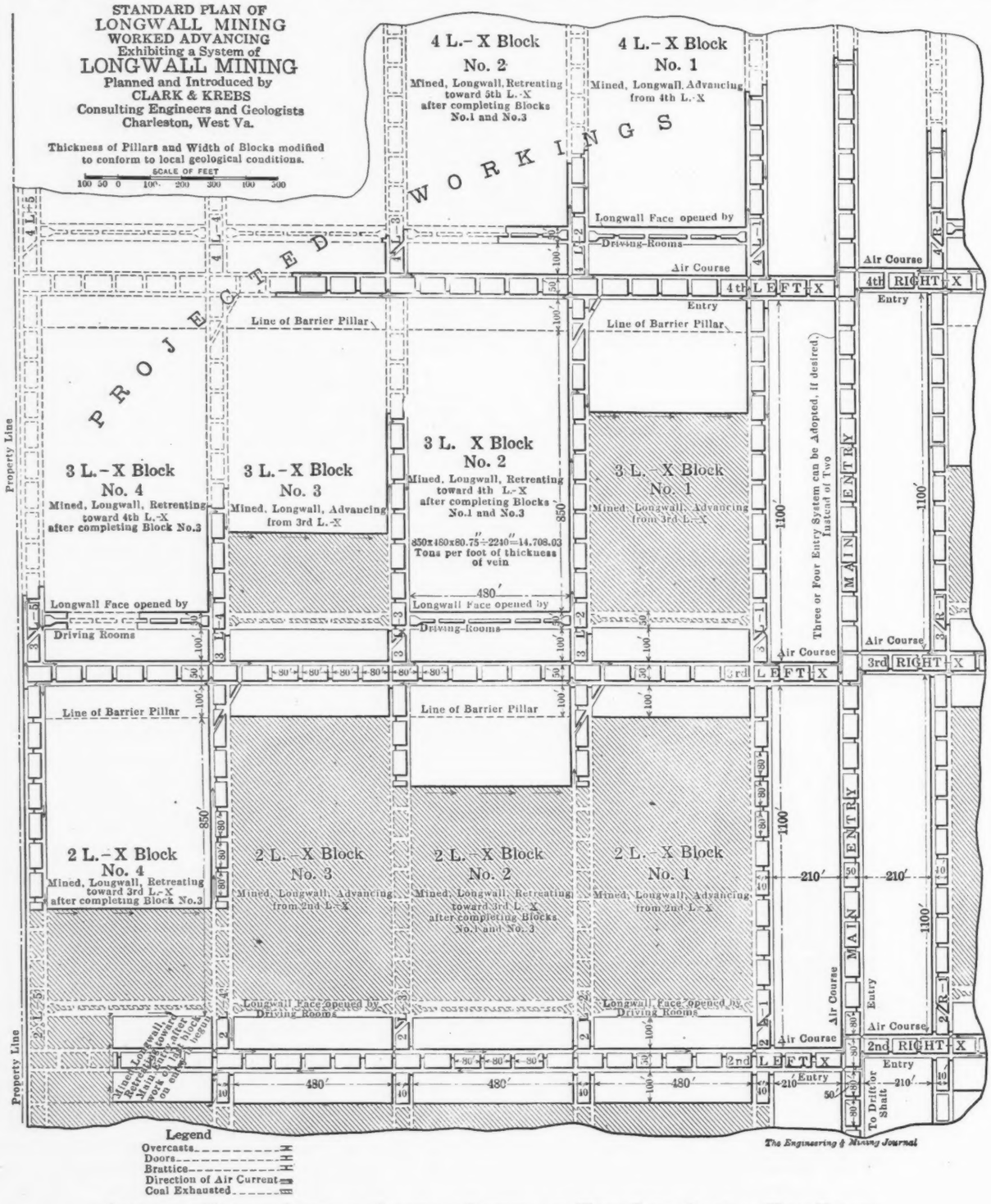
if necessary when the men are out of the mine.

(3) *Minimum Cost of Production*—This system concentrates the men, and tends to bring the cost price for day laborers, as trackmen, drivers, etc., to a minimum. This cost in some mines is enormous, while by this system it will be comparatively small. It also makes easier supervision, and in every way tends to lessen the work of the mine superintendent. It also lessens the cost of track material, such as ties and rails.

(4) *Increased Production*—By this system the greatest production can be produced, since it is possible to get the greatest efficiency from the men, machinery and material.

(5) *Greater Saving in the Recovery of the Coal Seam*—If this system is correctly operated, it will be possible to recover more than 95 per cent. of the coal from the seam, and thus eliminate the great loss of coal that can never be mined.

Charles A. Cabell, manager of the Carbon Coal Company, of Carbon, Kanawha


STANDARD PLAN OF
LONGWALL MINING
WORKED ADVANCING
Exhibiting a System of
LONGWALL MINING
Planned and Introduced by
CLARK & KREBS
Consulting Engineers and Geologists
Charleston, West Va.
Thickness of Pillars and Width of Blocks modified to conform to local geological conditions.
SCALE OF FEET
PROJECTED WORKINGS
4 L.–X Block No. 2
Mined, Longwall, Retreating toward 5th L.-X after completing Blocks No.1 and No.3
4 L.–X Block No. 1
Mined, Longwall, Advancing from 4th L.-X
Longwall Face opened by Driving-Rooms
Air Course
4th LEFT X
4th RIGHT X
Entry
Line of Barrier Pillar
3 L.–X Block No. 4
Mined, Longwall, Retreating toward 4th L.-X after completing Block No.3
3 L.–X Block No. 3
Mined, Longwall, Advancing from 3rd L.-X
3 L. X Block No. 2
Mined, Longwall, Retreating toward 4th L.-X after completing Blocks No.1 and No.3
850×480×80.75÷2240=14,708.03 Tons per foot of thickness of vein
3 L.–X Block No. 1
Mined, Longwall, Advancing from 3rd L.-X
Three or Four Entry System can be Adopted, if desired, Instead of Two
MAIN ENTRY
1100′
Property Line
Driving Rooms
480′
3rd LEFT X
3rd RIGHT X
2 L.–X Block No. 4
Mined, Longwall, Retreating toward 3rd L.-X after completing Block No.3
2 L.–X Block No. 3
Mined, Longwall, Advancing from 2nd L.-X
2 L.–X Block No. 2
Mined, Longwall, Retreating toward 3rd L.-X after completing Blocks No.1 and No.3
2 L.–X Block No. 1
Mined, Longwall, Advancing from 2nd L.-X
210′
2nd LEFT X
2nd RIGHT X
To Drift or Shaft
Legend
Overcasts
Doors
Brattice
Direction of Air Current
Coal Exhausted
The Engineering & Mining Journal

SHOWING A MODIFIED SYSTEM OF LONGWALL DESIGNED TO WORK THIN SEAMS IN WEST VIRGINIA

county, West Virginia, has secured a patent, dated Jan. 3, 1911, from the U. S. Patent Office of a "Block System of Retreating Longwall." His plan has a great many points similar to the one here proposed. He is now installing his system in one of his mines, and I see no reason why it should not work successfully. Mr. Cabell has every assurance that the system will be the one to work low seams of coal.

Review of Coal Events

By Frank Haas*

Were one to chronicle the events of the past half year in the coal industry of West Virginia, he would put forth as the predominating feature the demoralized condition of the coal trade. The severity and continued period of this depression has been remarked by some of our older operators to be the worst they have experienced. The causes of any of these commercial depressions are evidently so entangled in multitudinous conditions that our wisest economists have not yet been able to dissect them.

The present controversy in our National Congress over Canadian reciprocity can have but little effect, and that indirectly, on the West Virginia coal industry. One of our Senators has offered an amendment to the reciprocity bill, the effect of which will be to place Canadian soft coal on the free list whenever the President shall have sufficient evidence that the Canadian duty on American coal is removed. It would be an interesting subject indeed to investigate, free from all political features and localism, whether as a whole, this country would be benefited by free coal with Canada. True, some districts would be materially benefited while some others might suffer. It is stated that statistics show that American coal is imported into Canada largely in excess of Canadian coal imported into this country, the proportion being about seventeen to three. We trust, whatever the legislation, that the most good will come to the greatest number of people.

The recent decisions of the Supreme Court on the famous trust cases, particularly that of the Standard Oil Company and others pending almost as important, seem to have had a reassuring effect on the larger industrial interests of the country. We are told that business conducted with no unreasonable restraint of trade is legitimate, whatever that may mean. The layman can be forgiven, however, if he does not understand a subject or decision about which our wisest counsel cannot agree. The country at large has faith in our courts and we trust that their action will relieve the apparent strain to which this matter has subjected the business interests of the country.

Reduction of Freight Rates

A question of particular interest to West Virginia coal operators, is now in hearing before the Interstate Commerce Commission. This is the demand from the so called Pittsburg operators for a reduction of freight rates from the Pittsburg district to the lakes. The point really at issue is a further differential against West Virginia coals. The argument is advanced that the cost of operation in the Pittsburg region is greater than that of the West Virginia fields, that their coals cannot be sold in competitive regions at a profit for this reason. I believe that a careful analysis would reveal that their excess of cost is due, not to natural conditions, labor or materials, but to high fixed charges which they carry on their coal lands. The coal-land speculators of the Pittsburg field have boasted that the value of coal lands has risen from $50 an acre to as high as $3000 per acre. Evidently someone is confused as to the relative definition as to value and price. Would it be unreasonable to suppose that such profit to which the Pittsburg region operators are justly entitled has been long anticipated and discounted by these speculators in coal lands and has long since been carefully tucked away in their pockets? Should the Interstate Commerce Commission be convinced that a readjustment of freight rates is reasonable or just, the first indication of prosperity for Pittsburg operators will be the glad news that Pittsburg coal lands have again increased in value.

Coal dust is still in the lead of subjects of technical discussion not only in this country but in nearly all foreign countries in which coal mining is an important industry. Some time ago the question of permissible explosives was considered of greatest importance, but for some reason the interest in this has begun to lag. The theory then was, that the most important feature in the prevention of coal-dust explosions was to prevent an initial explosion. I would be sorry, indeed, to learn that this is no longer considered as the most important feature. We, and I mean Americans especially, have yet much to learn about permissible explosives, and, among many others, I am not yet moved to the spirit of implicit faith in the permissible explosives now offered us commercially. The trend of endeavor now seems to be to prevent the propagation of an explosion if once started. Watering, once so universally urged, has apparently been temporarily abandoned and in its place stone dust is highly recommended. It must be borne in mind that most of these rapidly succeeding conclusions emanate mostly from foreign countries, and it is highly essential that we keep before us the relative conditions under which coal is mined in the various countries. For instance, in most European countries the main haulways are in rock tunnel, while ours are in coal, and they do not have the loose-end-gate mine cars which are used almost exclusively in this country.

Belgium still pins its faith to permissible explosives and allows no watering; Germany is extravagant in its watering systems, while England and France tend toward the stone dust as a preventive of propagation. Where there is still such a lack of agreement as to the proper remedy I would advise you to keep your mines wet, when you have to shoot, shoot with care, and do not fail to practise vigilance, the lack of which has caused more disasters than all others.

It is gratifying to note that our National Bureau of Mines is still working with the enthusiasm that characterized its beginning. It has had several opportunities within the yast year to lend itself to practical rescue work. It is reported that the experimental mine at Bruceton will soon be ready for practical experiments. I do not hesitate to state that this method of taking an actual mine for experimental purposes will prove a great success, not only for verifying some of the conclusions which have been tentatively reached with less accurate methods, but also in the discovery of new things which nothing but the actual combinations of conditions as found in a coal mine can illustrate.

Accidents with Permissible Explosives

Only a few days ago my attention was called to the fact that a mine explosion had occurred in a mine near Clarksburg, in which there was no open light and the shot which was set off, and coincident in time with the explosion, was discharged by battery from the outside and the powder used was one of the permissible type, passed by the Pittsburg Testing Station. True, the mine contained firedamp, which was well known at the time, but every known precaution had been taken to avoid accident. One man evidently had faith and stood partially in front of the mine opening and was badly burned and had his face shot full of coal.

Another incident not quite so recent has come to my notice, where a permissible powder set the mine on fire possibly in the presence of a small gas feeder. It is such cases as these that need special investigation, to find out just what the peculiar conditions were which made them possible. In the first case mentioned the mine was small and no one was in it when the explosion occurred. In the latter case men were present and extinguished the flame before it had time to spread.

West Virginia had but one dust explosion to record during the past year. The unfortunate accident at Ott Mine, on

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Note—President's address delivered before the summer meeting of the West Virginia Coal Mining Institute, at White Sulphur Springs, W. Va., June 19-20, 1911.

April 24, which cost the lives of some 23 men, was caused, in the opinion of our chief mine inspector, by a shot fired in the solid and that the explosion was propagated through the mine by the presence of dry dust. Whether black powder or Monobel was used was not definitely determined, but Mr. Laing is of the opinion that it was black powder. The fact that there was a battery and wire leading from this shot would indicate a rather unusual method of shot firing if black powder was used.

United States Coke Production

The year 1910 was a record breaker in coke manufacture, with an output of 41,681,410 short tons, an increase of 2,366,345 short tons over the 1909 figures, and even exceeding by 901,846 short tons the banner year of 1907, although the value of the 1910 product was $11,842,859 less than that of 1907. The following figures, compiled by Edward W. Parker, coal statistician of the U. S. Geological Survey, show the production and prices of coke manufactured in the United States during the last four years:

	Coke Produced (Short Tons)	Value	Average Price Per Ton
1907.....	40,779,564	$111,539,126	$2.74
1908.....	26,033,518	62,483,983	2.40
1909.....	39,315,065	89,965,483	2.29
1910.....	41,681,410	99,696,267	2.39
	Coal Consumed (Short Tons)	**Value**	**Average Price Per Ton**
1907.....	61,946,109	$ 72,784,851	$1.18
1908.....	39,440,837	45,222,474	1.15
1909.....	59,354,937	62,203,382	1.05
1910.....	63,045,795	74,808,114	1.19

It will be observed that in the production of coke in 1910 there was a larger relative increase in value than in quantity, and that the average price per ton advanced from $2.29 in 1909 to $2.39 in 1910, from which it might appear that the state of the coke industry in 1910 was highly satisfactory. Such, however, was not the case, for whereas the value of the product of 1910 exceeded that of 1909 by $9,730,784, this increase was more than offset by the higher value of the coal charged into the ovens. The quantity of coal used in the manufacture of coke in 1909 was 59,354,937 short tons, valued at $62,203,382; in 1910 the quantity of coal used was 63,045,795 short tons, valued at $74,808,114. The increase in the value of the coal used in 1910 over 1909 was $12,604,732, or $2,873,948 more than the increase in the value of the coke.

In the United States, industrial coke is produced by two methods—in beehive ovens, where the coke is the only product recovered, and in byproduct ovens, where all the important subsidiary products are conserved, such as gas, ammonia, creosote and coal tar. At the present time the bulk of the coke is made in the old-fashioned beehive ovens with an annual wastage of millions of dollars worth of byproducts. In 1910, according to Mr. Parker, 17.13 per cent. of the total coke output was made in byproduct ovens, as against 15.91 per cent. so produced in 1909. The figures obtained by the Geological Survey show that there is a gradual increase in the use of byproduct ovens. At the close of 1910 there were 2187 coke ovens in course of construction, and of these 920, or 42.07 per cent., were byproduct ovens.

Notwithstanding the increased production and the higher value of the coke in 1910 as compared with 1909, the year was decidedly unsatisfactory from the producer's standpoint. It has already been noted that the increase in the value of the coal used exceeded the increase in the value of the coke produced and that the net result of the year's business was really a loss rather than a gain over the preceding year. The tendency of prices was downward from January to December and in the later part of the year much of the coke business was conducted at a loss.

Anthracite Mine Inspectors' Examination

SCRANTON CORRESPONDENCE

The following are the questions which were placed before the candidates who took the anthracite examination for mine inspectorships in Scranton recently.

The candidates who have passed this examination are eligible for nomination at the Republiccan and Democratic primaries, which will be held at some date not yet announced. All mine inspectors are elected by popular vote in the coal regions of Pennsylvania, after having passed this preliminary examination.

All of the mine inspectors who are at present in office in the anthracite districts, except one, presented themselves before the Board of Examiners:

(1.) Give name, age, place of birth, post-office address. Are you a citizen of Pennsylvania? State your experience in the anthracite coal mines of Pennsylvania. (20 points).

(2.) Describe your actions in detail, as mine inspector from the time you receive the report of a mine accident to your final disposition of the case? (10 points).

(3.) If 60 h.p. will circulate 40,000 cu.ft. of air in an airway 6x8 ft. and 6000 ft. long, what horsepower will be required to circulate 50,000 cu.ft. of air in an airway 6x10 ft. and 4000 ft. long? (10 points).

(4.) What improvement would you suggest in the mine law governing the hoisting and lowering of employees in shafts? (10 points).

(5.) Name and quote the section of the mine law that gives the mine inspector the greatest scope for his discretion in carrying out the duties of his office. (10 points).

(6.) What volume of air will be consumed in the complete combustion of 100 cu.ft. of methane? (10 points).

(7.) What improvement on the present system of signaling in the mines would you suggest, with a view to greater safety? (10 points).

(8.) Name the most recent, and what you consider to be the most effective steps taken around the coal mines of Pennsylvania to reduce accidents and fatalities. (10 points).

(9.) The weight of air in a downcast shaft 325 ft. deep is 1950 lb. at a temperature of 60 deg. F., and a barometer of 30 in., and the difference of the weight of air in the two shafts is 294 lb., what is the length of the motive column? What is the area of the shaft in square ft? (10 points).

(10) What is your opinion regarding the mine law relative to the arrangements in shafts and slopes with a view to reducing accidents? (10 points).

(11.) A squeeze is reported to be in progress in a mine in your district; give a concise description of your method of procedure as mine inspector. (10 points).

(12.) What load will a pair of first-motion hoisting engines lift, having cylinders 20 in. in diameter by 40-in. stroke, cylindrical drum 12 ft. diameter, and a pressure at steam gage of 50 lb., steam cutoff at ¾, average pressure in steam cylinder 48.2 lb.? (10 points).

(13.) State the necessary precaution to guard against mine fires. (10 points).

(14.) Name the equipment of an up-todate mine inspector's office, and describe in detail the records he should keep on file. (10 points).

(15.) Assume two veins, *A* and *B*, one overlying the other, on a pitch of 35 deg.; a tunnel is driven from top to under vein, 300 ft. in length. The vertical hight from inside end of tunnel to upper vein is 210 ft., and the pitch distance is 366 ft. from the mouth of the tunnel to the intersection of vertical line. What is the thickness of the strata between veins? (5 points).

(16.) What additional precautions would you recommend to reduce accidents from blasting? (10 points).

(17.) How would you proceed as mine inspector to reduce the accidents in each of the 30 mines of your district? State fully. (10 points).

(18.) If the circulation of 36,000 cu.ft. of air in an airway 6x10 ft. and 5000 ft. long requires 10.9 h.p., what quantity of air will 16.35 h.p. circulate in an airway 8 ft. square and 8000 ft. long? (10 points).

(19.) What will be a safe working load for a plow-steel hoisting rope ⅞ in. diameter? (10 points).

(20.) What would you recommend to make the "first-aid service" at the mines effective? (5 points).

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Eugene Coste is at Calgary, Alberta.

E. J. Gilbert, Mazatlan, Mexico, is in Los Angeles for a few weeks.

L. Vogelstein sailed from New York for Europe on July 4, to be absent about two months.

W. G. Page, of Salt Lake City, is in Oregon making an examination of Placer ground for W. L. Keith, of Los Angeles.

H. C. Osterman, of Deadwood, S. D., returned to that place from Chicago in his automobile, making the 1024 miles in 5½ days.

A. B. Willmott, of Toronto, Ont., recently examined mining property at Fort Frances, Ont., and in Quebec, near the Maine border.

Jesse J. MacDonald has completed his work in Utah, and will be in Colorado for a time, returning to Los Angeles, Cal., early in July.

Chas. A. Giffen has returned to Los Angeles from an examination of the Wilson Mesa placer and the Moab oilfields of Grand county, Utah.

John Gray, general manager of the Wasp No. 2 Mining Company, in the Black Hills of South Dakota, will spend the summer in Europe.

Gordon S. Duncan has opened an office at 28 to 29 St. Swithins lane, London, E. C., England, as agent for the Mines Management Company of New York.

David Richards, who has been in Canada for some months representing the Bewick-Moreing interests, sailed for England June 10, expecting to return shortly.

Rudolph L. Agassiz, vice-president of the Calumet & Hecla, has returned to Boston after a visit at the various properties on the Lake with which he is connected.

James McNaughton, general manager of the Calumet & Hecla and allied companies, will leave shortly on a European tour, accompanied by his wife and daughter.

T. M. Lowry, inspector of mines on the Gold Coast, West Africa, for the past three years has been promoted and transferred to Northern Nigeria to act in like capacity.

H. J. Freyn, formerly with the Illinois Steel Company, South Works, South Chicago, Ill., has accepted a position with the Allis-Chalmers Company, of Milkaukee, Wis.

T. J. Grier, superintendent of the Homestake Mining Company, has returned to Lead, S. D., after a vacation of a month, spent in the Eastern United States and Canada.

H. F. E. Gamm has resigned the position of chief engineer of the Orford Copper Company and will, after a month's rest, do consulting work with headquarters at Rutherford, N. J.

René E. Hazard, mining engineer of Medellin, Columbia, sailed from New York recently for a month's visit in Europe, before returning to Colombia where he is interested in hydraulic mining.

Colonel John Carson, president of Crown Reserve Mining Company, Cobalt, Ont., is now in London. S. W. Cohen, general manager of the company, has just returned to Cobalt from a trip to Montreal and New York.

Irving A. Palmer has resigned his position with the American Smelting and Refining Company in Mexico and is now assistant superintendent of the Springfield plant of the United Zinc and Chemical Company.

F. B. Weeks, who has been superintendent of the Ohio & Colorado smelting works at Salida, Colo., has been appointed consulting metallurgical engineer for the Metallurgical Company of America, with headquarters in New York.

Prof. Arthur J. Hoskin has resigned from the chair of mining at the Colorado School of Mines in order to reëngage in the practice of his profession as a mining engineer. He has opened an office at 308 Commonwealth building, Denver, Colo.

N. L. Stewart, of the engineering department of the Garfield Smelting Company, has been at the Murray plant of the American Smelting and Refining Company for the past two months, getting out plans and estimates on proposed new work.

W. C. Mitchell, who for several years has been general superintendent of the Dominion Steel Company, at Sydney, has accepted the general superintendency of the Algoma Steel Company, one of the subsidiary companies of the Superior Corporation.

Dr. C. C. O'Hara, head of the department of geology, has been chosen president of the South Dakota State School of Mines, at Rapid City, succeeding Dr. Charles H. Fulton, who has taken the chair of metallurgy in the Case School of Applied Science.

Captain John Edwards, the manager of the Falmouth Consolidated Mines, Cornwall, England, has resigned after three years' service, and Captain Gates has been appointed. Captain Gates was manager of the mines in 1907 and left to take another position.

Forest Rutherford, for the last seven years assistant superintendent of reduction works, Copper Queen Consolidated Mining Company, Douglas, Ariz., has gone to Morenci, Ariz., to fill the position of smelter superintendent for the Detroit Copper Mining Company, of Arizona, one of the subsidiary companies of Phelps, Dodge & Co.

W. A. Macleod, general manager of the Brilliant Extended Gold Mining Company, Charters Towers, Queensland, has been awarded a special prize of 40 guineas offered by Goldfields Consolidated through the Institution of Mining and Metallurgy for his paper on "Surface Condensers in Mine Power Plant." An abstract of this paper was published in the JOURNAL.

Alonzo F. Bardwell, who has been manager of the assay office of Bettles, Mathez & Co., Salt Lake City, for the past three years, has purchased the interests of Mathez & Co., and in future the firm name will be Bettles & Bardwell. Mr. Bardwell will continue to devote his entire time to the business, having brought with him the experience of 23 years in the work at Aspen, Colo.

OBITUARY

Dr. Wilhelm Michaelis, a well known metallurgical chemist, died at Hamburg, Germany, May 14. He was the first to suggest and advocate the use of blast-furnace slag for making cement.

Howard Wood died at Philadelphia, July 1, aged 66 years. He was for many years prominent in the iron and steel trade, and for a number of years was president of the Alan Wood Iron and Steel Company, of which his father was the founder.

SOCIETIES and TECHNICAL SCHOOLS

University of Pittsburg—With the foundations so ably laid by Professor Selwyn E. Taylor, William Glyde Wilkins, F. Z. Schellenberg, and Director Harold C. George, the School of Mines was reorganized in 1908. There was then introduced optional practical (coöperative) work, minimum of required, with a maximum of elective (optional) studies, while the requirements for graduation were raised after 1911. Special provision was made for men who wished to prepare for the operating, managing, or business sides of mining, metallurgy, geology and ceramics, instead of for the engineering sides only. Particular attention was given to mining economics, law, management, valuation, costs, prospecting, etc. The results have been such that within three years a new mining building, costing $175,000, has been erected, equipped and occupied. The attendance has been raised from eight to 72, the faculty increased from two to 18, and the graduating class from one to 18 this year.

The governor of the State has recently approved a bill giving an appropriation of $400,000 to the school of mines and engineering.

Editorial Correspondence

Reports from our own Representatives on Important Events from Many Important Mining Centers of the World

San Francisco

June 28—Despite the low price of crude petroleum and the large surplus, notwithstanding the decline in production in May, there is no disposition apparent in any of the fields to curtail production. On the contrary there is evidence of hurry with new drilling and an inclination to keep the pumps going on the productive wells. New territory, far enough distant from producing wells to make the undertakings appear to be wildcatting ventures, is being opened in two counties, Ventura and Orange, and in Los Angeles county a venturesome prospecting for light oil below the heavy production line is being undertaken. The Southern Pacific has abandoned, apparently, its policy of conservation and is not only adding to its available output, but drilling new wells in the Coalinga district. The Associated is increasing storage capacity. The Union is advancing its productive and marketing power. The British companies are extending drilling operations. The Standard is preparing to increase production and manufacture. There is talk of still another new refinery, by competitive capital, at Martinez. The Independent Agency is apparently endeavoring to keep step with the advancement. In fact, the present indications are that the output of 1911 will exceed that of 1910 rather than fall below, as the low price and large surplus would suggest. The independents have been variously advised to go slow and conserve their oil in the ground, awaiting greater demand and the consequent increased prices; but the independent oil producer gives as little heed as would the big producers should the warning come from the same source. The only people interested in the production of oil who are slow in their movements toward the increase in the year's output are the promoters. The legal status of the industry is not conducive to activity on the part of the operators who operate only in stocks. But there are several encouraging signs of an increased demand for both crude and refined products, particularly crude and distillate fuel, and gasolene. The decision of the Secretary of the Interior in the Alaska coal-land cases will undoubtedly result in an increased demand for oil fuel for both railroad service and the mining industries in Alaska, and in such other parts of the Pacific coast where Alaska coal might have been made available within reasonable time. The present market absorption of a minimum of 65,000,000 bbl. per year should be doubled within a few years and the available supply, based on the theoretical determinations of the U. S. Geological Survey, appears to be sufficient to meet the market demands for a great many years to come, regardless of the fact that there may be considerable waste resulting from an increase in the available surplus above ground. The California oil producers have weathered through numerous difficult situations, and they are likely to pass the present supposed crisis without much damage or detriment to the industry as a whole.

Denver

June 28—Having sorted out the hundreds of applications and reached decisions regarding the available men, the Grubstake committee finds that it can make use of $20,000 and if the enterprising citizens of Colorado are wise, they will increase the *Republican's* list to that figure and bring back the mining industry to its former commanding position. One thing above all others has impressed the committee and that is the many places where indications point to great orebodies that have not been developed nor encouragement given to those who would develop good prospects. It was asserted at the beginning of this campaign, as it has been contended for years, that the reason no new camps had been discovered in Colorado was because no more mineral fields were to be found. People in authority made this assertion, probably for selfish reasons. It is without foundation. If the Grubstake committee did nothing else, it gave the lie to this myth—that Colorado as a mining State had reached its limit and must depend on old camps. Districts of remarkable surface promise that have not had a hole dug in them are coming to light every week.

Reports come in daily of the new finds in the placer diggings and to the old timer it appears as if we were again in the early days. Newlin's gulch, 35 miles from Denver, a tributary of Cherry creek, where it is supposed Cherry creek's enrichment of gold came from, is the scene of much activity. For several years there has been an old man working in the gulch with only a sluice box 10 ft. long and as his bank account grew people wondered at it. Since April, men have quietly acquired the ground around his, and now there are several active companies at Newlin's gulch. B. F. Hughes & Co. have a 10-h.p. gasolene engine and pump and sluice boxes 200 ft. long. F. Parkington & Co. are equipped with a 25-h.p. gasolene engine, Pierce amalgamator and a table. Bowen & Mayers are installing a plant on their 160 acres. The ground goes as high as $12 per cu.yd. and the average is said to be over $4. So quietly has this ground been taken up that there is none left for location.

From Terryall come reports of the revival of that district above the Peabody ranch where in 1860 and 1861 the Peabodys recovered over $1,000,000 in gold from 100 acres. It was from this district that the famous camps of Alma, Fairplay, Breckenridge and Leadville were opened as the prospectors drifted from placer mining in the Terryall district to quartz and lead mining.

Butte

June 26—That the Radersburg camp has reawakened to a life of much greater activity than ever before is evidenced by the amount of work being done by the numerous companies recently organized. A company composed of J. C. Adams, assistant general superintendent of the Anaconda company's mines at Butte, and others, is developing the Black Diamond group of claims in this district and indications point to the fact that they have a promising property. The Keating company has an orebody 400 ft. in length and averaging 3 ft. in width, the best ore being on the 600-ft. level, the greatest depth attained so far, and shipments of three cars of this ore per week are being made. At the Black Friday mine a rich strike has been made on the 700-ft. level at a point 125 ft. from the shaft. The Ohio Keating is also shipping about 3 cars of ore a week.

An electric plant with capacity for sinking to 500 ft. is being installed at the Combination Keating Company's property, and buildings are being erected in preparation for systematic mining operations.

The Calumet & Corbin company is sinking a new shaft which will be carried to the 200-ft. level before development work is started. An electric plant is being installed by the De Lome company and as soon as the retimbering of the old shaft on the property is accomplished, sinking will be resumed. The Hodgens-Greene company, of Butte, recently took a $100,000 bond on a group of claims in the district, and are now sinking a shaft.

Salt Lake City

June 29—Local mining circles are interested in the further work that the United States Geological Survey is about to take up in the Tintic district to supplement and bring up to date the last report, the field work on which was completed in 1896. Waldemar Lindgren, who has succeeded S. F. Emmons as the head of the economic branch of the Survey in regard to metals, has been in Salt Lake making arrangements for the work. Mr. Lindgren is at present in Washington, but will return to Tintic by July 12; meantime his assistant is on the ground. The field work will probably take four or five weeks. The Tintic Special Folio, a part of the Geologic Atlas of the United States, was published in 1900, the geology being worked out by G. O. Smith and G. W. Tower under the direction of Mr. Emmons. Since this work was done there have been a great many changes in the camp, many of the largest producers, including the Colorado, Iron Blossom and Sioux, have been discovered and development has furnished much new geological data. Permanent water level has been found in the Centennial-Eureka, and work below this level should soon give some data as to the primary or unoxidized ores of the camp, regarding which little is known at the present time. If the results of this survey are published promptly they will undoubtedly be a great help to the district.

The magnitude of the mining and smelting industries in this State is shown by the statistics, which have been collected and compiled by the National Copper bank. According to these, the seven mineral counties of the State have produced $482,106,000 in copper, gold, silver, lead and zinc, since the first ox teams hauled ore to the valley. Salt Lake City, the business center of a million square miles, owes its prosperity largely to these industries. Salt Lake valley, with Tooele valley which leads into it, is today one of the greatest ore-smelting centers of the country. The plants at Tooele, Midvale, and Garfield employ an average of 2470 men throughout the year, who are paid $2,178,000 in wages. The other running expenses, taxes, etc., are double that amount annually, exclusive of the money spent in improvements. The present investment in plants, power houses and machinery aggregates $12-250,000, not counting the large holdings in land, mining claims and mines. The four plants have a combined smelting capacity of 11,700 tons of ore daily and in the last six months have handled 1,078,-820 tons. The total value of the ores smelted in the state in 1910 was placed at $27,825,176. Provisions have been made recently for treating low-grade lead and zinc ore heretofore unprofitable, which will add to the output. Much of the ore is of a grade that can be smelted direct, but a large tonnage is handled by the various concentrating plants. Among these are the Magna and Arthur mills of the Utah Copper Company at Garfield, employing 1460 men, the Ohio Copper company's mill at Lark, the United States Smelting Company's mill and separator at Midvale, the mills of the Silver King, Daly West, Daly-Judge, and Grasselli zinc plant at Park City, the cyanide mill of the Consolidated Gold Mines Company at Mercur, the Utah Apex, Bingham-New Haven and Redwing mills at Bingham, that of the South Utah at Newhouse, and other plants in other parts of the State. It is estimated that these mills represent a total investment of $9,745,000, that they employ 2510 people and carry a monthly payroll of $222,025.

Cobalt

June 30—Despite the fact that during the early part of the year, production from the Cobalt mines was much curtailed on account of the shortage of power, the output for the first quarter amounted to 7,530,487 oz. of silver, which is an increase of 1,130,560 oz. over the corresponding quarter of 1910. The above figures include the shipments from the South Lorrain and Gowganda districts. In addition to the silver, there was shipped from Cobalt 107,846 lb. of cobalt and nickel oxides which were valued at $29,882. The tonnage shipped was 3786 tons of ore and 1974 tons of concentrates, which was less than the corresponding period for last year; but the average value was higher, due to the greater tonnage of ore being concentrated, and the increased shipments of bullion.

Porcupine

June 30—The West Dome company has lately been having a good deal of trouble over the ownership of some of its properties, and unless the matter can be settled amicably it may lead to serious difficulties. When the properties were bought, the company acquired two full claims and a fraction, and a 50 per cent. interest in the two Curts claims, the other half being owned by the Pell Syndicate. It is on these two latter claims that the Foster vein, one of the best in the district, was found. The other properties were prospected, but nothing of great importance was found. Work was concentrated on the Foster vein, and disagreements arose between the company and the syndicate. It is now stated that the syndicate will apply for a partition sale of the properties and in such an event, the company may have to purchase the other interest in order to have anything left and will probably have to pay a high price for it.

Toronto

June 30—At a meeting held in Toronto, June 29, the shareholders of the Island Smelting and Refining Company, capitalized at $3,000,000, of which $2,000,000 has been issued, agreed to give Sir Donald Mann, of Mackenzie & Mann, an option on its patents for five months. If the process covered by the patents for refining low-grade ores proves to be satisfactory in the treatment of British Columbia lead and zinc ores, the purchaser agrees to pay $5,000,000 to the company and also to give the shareholders an interest of 25 per cent. in a new company, to be capitalized at $10,000,000, for controlling the Island process for the world.

Mexico

June 28—The revolution, and consequent period of destruction, is over but the country is barely entering on its work of reconstruction. The new party will be watched with great interest by capitalists and investors the world over. It would be unjust to express a definite opinion upon the outlook or possible condition of present and future investments in this country, as the political sky is by no means clear, and will not be so until the presidential elections, to be held Oct. 1 and 15, definitely decide the future trend of politics in this country. The present provisional governments, federal as well as state, are doing their best to establish order and protection. One of the most important acts, that of peacefully disarming the 30,000 revolutionary soldiers stationed all over the country, has begun, and by July 15 this menace to the peace of the country will have been eliminated. The soldiers are laying down their arms, and are being sent to whatever part of the country they wish to go, at the expense of the government. They will also receive pay, in a lump sum, and where possible, will be employed at mines, farms or on railroad work.

The mining and smelting industry, being controlled chiefly by foreign interests, did not suffer, except in isolated cases, any direct damages in property destruction or money losses. The main loss to the industries was caused by the many enforced shut-downs due to interruption of traffic in general and shipping facilities of supplies, ores, bullion and pay-roll money in particular. On the whole the foreign interests have had little cause for complaint.

If Madero is elected president, and it is almost a certainty that he will be, the mining industry, as long as it does not expect special or illegal concessions, should become more prosperous than it has ever been. Madero is progressive, a business man with large experience in many branches, such as mines, smelteries, flour mills, farms, rubber factory, etc., in all of which the Madero family has large interests, and his intentions are absolutely honest and sincere. Whether he can form his organization and succeed in his great task of reconstruction and reorganization, is a question of a little more patience and faith: At present, "*Quien sabe?*"

The Mining News

Reports of New Enterprises. New Machinery. Installations. Development Work and Property Transfers. The Current History of Mining

Alaska

Alaska United—For the month ended May 15, the Ready Bullion mill crushed 18,058 tons, yielding $43,592 gross and net $15,396. Operating expenses were $28,196; construction $833. The ore averaged $2.41 per ton. For the same period the 700-ft. Claim mill crushed 17,265 tons, yielding $31,757 gross and net $4816. Operating expenses were $26,940; construction $5541. The ore averaged $1.84 per ton.

Arizona

Gila County

Miami—At the concentrator, unit No. 4 has been under experiment for some time, but is not yet ready to work at full capacity. It is not yet known how soon the remaining two units (4 and 5) will begin to handle ore. The delay at unit No. 4 is due to the management's decision to make an alteration in the bearings of the Burch rolls, replacing the present solid end with a plunger that may be removed and replaced at any time for repair or adjustment without the necessity of keeping the entire roll inoperative while the work of the machinists is being done. A tramway connecting the plant with the railroad in the town of Miami below is now in operation. Underground, the development is going forward at a rate of approximately 2000 ft. per month. The timber mat is being placed between the orebody and overburden.

Inspiration—At present mining operations are confined solely to development and it is improbable that the working force underground will be increased until the site of the mill and date of beginning its construction have been decided upon.

Live Oak—Shaft No. 1 is in the preliminary stages of the work that will block out the Live Oak orebody by drifts, crosscuts and raises for the caving system that later will be employed to mine the ore. The depth of this shaft is 445 ft. An extensive plan of surface improvement and construction is in its inception at the property. Old bunk houses have been rehabilitated, work on a new office building has begun, a telephone system connecting all operative points on the property with the office has been installed, the coal-burning fireboxes at the central power house have been replaced by oil burners, and many other improvements are being contemplated.

Arizona Commercial—The Eureka shaft is now about 1150 ft. deep. A few feet below the 1100 the even diabase formation changed to a more broken nature. Drifting continues along the footwall of the Black Hawk vein on the 1000-ft. level. Crosscuts will be driven through the vein from this drift at intervals of 100 ft. Where crosscut the vein shows a width of about 40 ft. Whether commercial ore in sufficient quantity to be available will be developed on the vein is not yet known. The Black Hawk vein is undoubtedly the same known in the adjoining Superior & Boston mine as the Great Eastern. The Arizona Commercial is drifting north on the 1000-ft. level to explore the Old Dominion fault. As the dip of the fault at this part of the district has never been ascertained, it is impossible to say how far the crosscut must be driven to reach its objective point.

Superior & Boston—As a result of development of sulphide ore in the Great Eastern vein on the tenth level and other disclosures in this and the Arizona Commercial mines, shaft sinking to the twelfth level will be started at once. Negotiations have been entered for purchasing a half interest in the Arizona Commercial smeltery, which has a capacity of 400 tons per day, and which can be doubled at small cost. A loan of $200,000 has been secured. A resolution has been adopted to increase the capital stock from $2,500,000 to $3,000,000, the new issue of 50,000 shares to have a paid-in value of $4.50 per share. The present outstanding issue of 15,000 shares of full-paid stock is to be converted into part-paid stock on the basis of one share of full-paid stock for two shares of part-paid stock. The remaining 35,000 shares of the new issue will remain in the treasury.

California

Amador County

Lincoln—The 500-ft. crosscut on the 1200-ft. level, now in hard greenstone, will be extended 250 ft. in the expectation of tapping the vein disclosed in the 500-ft. level.

Bunker Hill—Dividend No. 60 has been paid. The cleanup for May was $30,000. The orebody on the 1950-ft. level is still supplying the mill.

Ione—This old copper mine on the Campo Seco belt has shipped 1000 tons since reopening. The shaft is down 300 ft. The hoist is driven by steam. D. F. McLennan, superintendent.

Amador Queen—Work of reopening this old mine in Hunt's gulch has begun. There is an old shaft 1000 ft. deep.

Butte County

Channel Mining Company—The course of the drift in this mine, near Magalia, has been changed to south and southeast, encountering a big body of gravel clean washed, and carrying jasper and granite boulders, which, with the dip toward the vertical, is taken as indicating the presence of the main channel, which is an extension of the old Pushbecker channel. New machinery will be installed. E. B. Ward, Oroville, manager.

Mineral Slide—The old work on this gravel mine, near Magalia, has been reopened 500 ft. and crosscut 281 ft. L. Cohn, Magalia, manager.

Calaveras County

Crossett Ranch—The 60-ft. shaft, sunk in 1868, on a quartz vein on this ranch, near Angels, has been reopened by Daniel Mackey. The old work was found intact below 40 ft. Careful assaying showed ore which 40 years ago was not considered profitable.

Inyo County

Lost Frenchman—High-grade ore is being shipped from this mine, in Burgess district, to the smeltery at Needles. The shipments from this and other properties in the district totaled $8000 for the second week in June.

Eureka—This group of claims at Chrysopolis, has been bonded by A. S. Loughrie and Carl Everett. A five-stamp mill will be built.

Santa Rosa—A silver strike was made recently in tunnel No. 5 in a cross vein 30 ft. in from surface. About 150 sacks of shipping ore are being extracted.

Monterey County

Development work continues in Los Burros district on the coast; roads and trails are being built and arrastres constructed.

San Bernardino County

Santa Paula—A carload of ore from these tungsten claims in the Spangler district, near Atolia, will be shipped to the smeltery, at Needles. Charles Churchill, owner.

Shasta County

Vulcan—Ore is being extracted from the lowest working, at 30 ft. Double shifts are working in the tunnel and on

the diamond drill. The property adjoins the Baiaklala.

TUOLUMNE COUNTY

Tappie—This property, north of Table mountain, has been bonded to Walter Tolbert and Harry Morgan, of Goldfield. In clearing the old tunnel a vein of sulphide ore was exposed. A new concentrator has been built and a new engine and boilers are ready for installation. D. L. Quirolo, Jamestown, owner.

Maddox—The mill and slimes plant of this group of claims, near Confidence, were destroyed by fire June 8. The plant will be rebuilt. John Frey, manager.

YUBA COUNTY

Pennsylvania—This company's mine, at Brown Valley, is now unwatered and deepening of the main shaft 200 ft. was begun June 10.

Manzanita—A tunnel is being driven and surface buildings are being built at this mine, at Brownsville. The force of 10 men will be increased.

Colorado

CLEAR CREEK COUNTY

Gem—An important strike was made last week on the 11th level, 850 ft. east of the Gem shaft, where the breast of the drift was in a streak of ore of a shipping grade.

GILPIN COUNTY

Central City—The North American Smelter and Mines Company, operating the Golden smeltery, has added to its mining properties in Gilpin county the Decatur and Helmer groups in Russell gulch on a long lease and bond and will work them on a large scale. These mines have been steady producers and with little or no water to hoist can be worked at great depth through the Newhouse Tunnel. There is no doubt that the new operators will be successful.

Chase—This mine, in Russell district, has shipped 10 tons of ore to the Golden smeltery.

Santiago—A force of 20 men is being employed, and Manager D. H. Burlingame expects to resume shipments of ore at an early date. In the event that the Argentine Central railroad is not opened for business this summer, the ore will be transported by wagon to the Independent sampler at Georgetown.

SAN JUAN DISTRICT

The Pandora group of mines on Sheep mountain, South Mineral creek, caused a stir in this district on account of a big strike. The Pandora group is now owned and being operated by William Sullivan, who for the last four years has confined his work wholly to development and has today over $100,000 worth of ore blocked and ready for shipment. The ore is lead and copper sulphide containing gold and silver.

Silver Lake—The mines and mill, which for the last two years have been operated under the leasing system, resumed operations, June 27, on company account under the management of L. R. Clapp, of New York. This property is owned by the American Smelting and Refining Company.

Vermillion—A rich strike has been made in this mine, near Animas Forks.

Humboldt—The option on this property, it is reported, is held by a French syndicate. The mine is now being sampled.

Bachelor—The leasers on the Bachelor have cut high-grade ore on the Khedive.

White Cloud—T. D. Darby, of Denver, and associates intend resuming work on this mine. Machinery will be installed.

Joker Tunnel—Preparations are being made to start the mill in a few days, when teams will haul ore to Ouray.

SUMMIT COUNTY

Snider Placer—This placer is being operated with giants in the pit. During all of last winter bedrock drifting on the pay streak was profitably carried on.

Reliance—During the month of May the Reliance boat dredged and washed more than 2100 cu.yd. per 24-hour day.

Wellington—Ore shipments during May aggregated 1900 tons; of this amount 300 tons was of a grade that had accumulated awaiting a favorable market.

SAN MIGUEL COUNTY

A. C. Greene, manager for the United Vanadium Company, of Springfield, Ohio, is preparing to send a five-ton test sample of uranium ore from the mine, near Placerville, to Liverpool. If the sample proves the ore to be of value, regular production will ensue.

TELLER COUNTY

Modoc—What appears to be an important strike has been made in this mine. Smelting ore was found about 35 ft. from the shaft. The vein has been opened on the fifth, seventh and ninth levels and a crosscut is being run to open it on the 200-ft. level.

Wild Horse—Work of remodeling the mill is progressing under supervision of Edward Bebee, of the United Gold Mines Company and John Tait Milliken, cyanide expert for the Golden Cycle. It may be another month before the treatment of ore can be commenced.

El Paso—The water receded about 50 ft. in the main El Paso shaft, evidently as the result of the opening of the drill well in the bottom of the shaft. Through some unaccountable reason the pipe opened, June 27, and let a great supply of water out. A party that went to the portal stated that the water had risen at least a foot and that there was double the usual amount of water flowing from the drainage tunnel.

Michigan

COPPER

Superior—No. 1 shaft is down below the 16th level and all the openings above are showing about the same richness that has characterized this property from the beginning of production. The recent fire underground was extinguished before any material damage was done.

St. Louis—The Calumet & Hecla are pushing the opening of the new shaft. The surface equipment used at one of the shafts at the Gratiot property has been moved to this site and will be ready to go into commission as soon as needed.

Ojibway—Developments at this property are encouraging, a good run of copper ground having been opened recently at the fifth level of No. 1 shaft.

North Lake—Recent developments in the drilling operations have disclosed a copper-bearing lode about 22 ft. wide, well mineralized.

Calumet & Hecla—The Chadbourne interests have secured from the supreme court of the State, a restraining order to prevent further proceeding in the proposed consolidation and to have Judge Streeter, of the Houghton county circuit court, before which the Chadbourne-Denton injunction was denied, show cause why the temporary injunction should not be granted.

Missouri

Little Mary—Chapman & Lennan have bought the interest of Ball & Gunning in this mine, at Neck City, and have assumed the management.

Kohinoor—J. H. Knapp, of Kansas City, has taken over the Kohinoor and the Clark mines on the Continental land, at Joplin. The mills have been improved and will start in a short time.

Montana

BUTTE DISTRICT

Butte-Alex Scott—This company has just made its report on operations for the year ended May 31, 1911. It states that owing to the fact that the first half of the year was devoted to development work, a loss of $2818 was entailed. There was mined 107,358 tons of ore that yielded $15.28 per ton; $9.60 per ton was paid for mining, bringing the total cost of ore extraction to $103,097. The ore was reduced at the Pittsmont smeltery, the transportation charges amounted to $1110, or 11c. per ton, and the cost of reduction $62,780, or $5.84 per ton. For labor and supplies $103,097 was spent.

Butte & Superior—The report for the year ended May 31, 1911, was filed on June 23. It shows that 101,038 tons of ore were extracted, worth $5.26 gross per ton. The total cost of ore extracted was $327,599 or $2.50 per ton. The cost of transportation of the ore to the con-

centrator at Basin, Mont., was $45,863, or 35c. per ton. Reduction costs came to $216,212, or $1.65 per ton. The amount paid for labor was $235,839; for machinery, $40,906, and for mining and milling supplies, $307,968. In the construction of mills $32,080 was spent and for development work $68,723, leaving $3722 as net proceeds of operations.

Ophir—The recent strike, made on the 300-ft. level of this mine of the Butte Central Copper Company, is proving to to even better than anticipated, as development goes on. The vein which was 2 ft. wide where first encountered, has now attained a width of 4 ft., and is rich in silver and gold. Drifting east on the vein previous to the strike developed only poor ore until a fault was passed, then when picked up again the vein was found to be rich. Shipments of about 50 tons of ore per day to the Washoe smeltery are soon to begin.

Tuolumne—For the purpose of taxation, a statement showing the net proceeds of the Tuolumne company for the year ended May 31, 1911, has been filed, the figures being as follows: Tons of ore mined, 31,509; value per ton, $15.26; gross value, $480,905; cost of mining per ton, $3.52; total cost of mining, $113,983; cost of transportation, $21,927; cost of reduction per ton $5.78; total cost of reduction, $181,904; paid for labor, $97,032; paid for supplies, $40,870; cost of improvements, $408; $24,768, net proceeds.

LINCOLN COUNTY

Libby Placer—P. J. Brophy, of Butte, president, is superintending the work being done on the property at Libby creek. Extensive ground sluicing is being carried on, and 80,000 lb. of steel pipe, which is to be used in reconstructing the company's plant on a larger and more improved plan, has just arrived.

MADISON COUNTY

Roach—Daniel Agoa, of Butte, is preparing to work the Roach mine, near Twin Bridges, and has a crew of men at work erecting a sawmill to cut timbers for the mine. As soon as the remaining snow is gone from the hills, Mr. Agoa will increase his force and start active mining operations.

PARK COUNTY

Yellowstone Geyser Cement Company—This company has been formed to manufacture cement from the immense beds at Gardiner, near Yellowstone park, and a mill is being erected. Eight carloads of machinery have just arrived and about 60 more have been ordered. If no delays in the plans occur, the mill will be operating after Oct. 1, of this year, when it is claimed that Montana will be producing the only white cement in America.

POWELL COUNTY

Following the lead of a number of other mining districts in Montana, which have been practically idle for years, the Elliston district, west of Helena, is coming to life again and a large number of claims are being developed and prepared for mining.

Weston—James McGovern and others are preparing to sink a shaft to a depth of 200 ft. on this property which two years ago was closed down on account of legal difficulties.

Julia—C. L. Fredericks, E. M. Brandegee and others, of Helena, owners of this property near the Weston and Big Dick mines, have eight men at work mining and developing, and several carloads of ore which are on the dump at present will be shipped as soon as the condition of the roads will permit.

Nevada

ESMERALDA COUNTY

Goldfield Consolidated—The official estimate of the production for June is as follows: Tons of ore treated, 28,540; gross value, $880,000; operating expenses, $230,000; net profit, $650,000. The report adds that the mines are looking well.

STOREY COUNTY

Mexican—Crosscutting the vein on the 2500-ft. level, a short distance back from the face of the north drift, gives a width at that point of 16 ft., the ore all averaging above $50 per ton from car sample assays. Eight feet of this cross section of the vein averages $85 per ton, and it is now believed that between 20 and 30 ft. will prove of milling grade. The vein on the 2500 has now been opened for 75 ft. in length.

Union Consolidated—East and west crosscuts on the south boundary line with the Mexican, show the vein to be at least 35 ft. wide; all the material is being saved as milling ore.

Ophir—The south drift on the 2500 level from the east crosscut is all in quartz, but the highest assay to date has been $15 per ton. The header is over 100 ft. north of the oreshoot opened on the 2500 level of the mine.

Oregon

JOSEPHINE COUNTY

Pennsylvania—E. C. Fawcett and F. W. Kelly have purchased this placer property on Elliott creek, and are planning development work.

Copper Mountain—The mine has been sold to the United Copper-Gold Mines Company, Grant's Pass, which will operate same on an extensive scale.

Jewett—This mine, three miles from Grant's Pass, has been sold to Eastern men, who are planning to begin operations at once. W. R. Oxley is in charge.

Pennsylvania

ANTHRACITE COAL

Philadelphia & Reading Coal and Iron Company—The financial statement for the 11 months of the fiscal year from July 1 to May 31 shows gross earnings, $32,212,429; expenses, $31,712,532; net earnings, $499,897. As compared with 1909-10, there was an increase of $973,-195 in gross receipts but a decrease of $730,472 in net earnings.

BITUMINOUS COAL

Pennsylvania Coal and Coke Company—The property of this company was sold under foreclosure June 23, and was bought in by the bondholders' committee. A new company will be organized at once.

United Coal Company—This Pittsburg company is offering an issue of $750,000 in 6 per cent. coupon notes, the proceeds to be used in improvements. The bonds are to be retired by a sinking fund of 10c. per ton on coal mined. The company owns mines in Somerset and Cambria counties in Pennsylvania, and in West Virginia, which are now producing at the rate of 18,700 tons a day.

South Dakota

BLACK HILLS DISTRICT

Bismarck Consolidated—Work has started on this property at Yellow creek. The cyanide plant will be enlarged to about 300 tons capacity. Crushing will be done first in a No. 5 and then in a No. 3 Gates crusher, the operation to be completed with two pairs of rolls. With an average of 4 ft. of stripping, pay material from 20 to 25 ft. wide and assaying about $3 per ton can be made available. Frank B. Hitchings is general manager.

Lucky Strike—Sinking will be resumed at this property. The shaft, at present about 200 ft. deep, will be continued to the 500-ft. level.

North Homestake—The first additional 100 ft. of shaft sinking has been completed and a small station cut at the 320-ft. level. The shaft will be continued 300 or 400 ft. further before crosscutting is started.

Gilt Edge Maid—Work on the smeltery and concentrator is progressing. The concrete retaining walls are completed, and carpenters and steel workers are at work on the superstructure.

Pluma—The equipment necessary to dewater the workings is being installed at this company's shaft, in Lead City. A. Filion has charge.

Harvest—A churn drill has been installed by Pittsburg men at this property, near Pactola, on Rapid creek. The ground is being explored as a possible dredging field. Frank C. Sherman has charge.

Custer Peak—Commencing the first week in July, this company will ship copper ore to the Omaha smeltery.

Jungle—This property, showing oxidized copper ore at surface, will be worked. John H. O'Brien, Albany, S. D., is manager.

Osterman-Danckwardt—Thirty narrow-gage, side-dumping ore cars have been purchased by the Burlington railroad from the Colorado & Southern railroad for use in hauling ore to this smeltery.

Decorah—Damage at this property of the Trojan company has been temporarily repaired and ore is being produced after a 10-day shutdown. A fire destroyed the orebins, a portion of the tramway, blacksmith shop and hoist house.

Utah

Salt Lake County

Utah Copper—Five sections of the Arthur mill are in operation, after having been revamped with the addition of Janney classifiers and Garfield roughing tables. Work has been finished on the Carr Fork and Markham Gulch bridges of the Bingham & Garfield railway, while the trestle over Dry Fork is well under way. According to latest reports, the line will be open to passenger traffic Aug. 1. The Payroll group of 10 claims, or a total of 140 acres, adjoining the Utah Copper and old Boston Consolidated territory, has been purchased. An additional 6650 shares of stock are reported to have been issued in payment. There is now outstanding $21,026,130 of the $25,000,000 authorized capital.

Ohio Copper—The sixty Deister slime tables recently ordered by this company have been installed in the mill at Lark. Of these, 24 are in operation, while the remaining 36 are ready to work at any time. The mill is reported to be handling about 1500 tons of ore daily, which will average 1.2 per cent. copper, and is making a saving of 61 per cent. The Heinze interests retained control at the annual meeting, June 7.

Columbus Extension—This company is using the Columbus Consolidated mill and is paying $1 per ton to the latter for the rent of it. Ore has been raised on 150 ft. from the tunnel level, and stoping started at the 100-ft. point. The output is about 15 tons per day.

Cardiff—Shipments of lead-silver-copper ore for the current season were started, June 16. A winze has been sunk 85 ft. on ore below the tunnel level, and shows three feet of good ore in the bottom. Water interfered with the work, and a tunnel between 2000 and 2500 ft. long is projected to open up this ground.

Big Cottonwood Consolidated—The stock has been listed on the local exchange. The capitalization is 1,000,000 shares, par value 25c., of which 198,000 shares are still in the treasury. There are eight claims located in the south fork of Big Cottonwood. Lead-silver ore has been opened in the old Baby McKee section. Present development consists of a shaft 200 ft. deep and about 500 ft. of workings. A part of the property is bonded for $2000. W. L. Harwood is president.

Tar Baby—Work has been started on a new tunnel about 60 ft. below the upper workings. C. R. Green is manager.

Utah Mines Coalition—Shipments were started from this property, June 19. Raising on ore from the main tunnel has been started, and is up about 50 ft., with four feet of ore in the back. There are between 250 and 300 tons of ore on the dump, beside what is broken and stored in the mine. About 15 tons per day are being shipped.

Emma—Stockholders have received a notice of a meeting, July 8, at which new officers will be chosen. The Knights, of Provo, have obtained control, and headquarters will probably be moved from Salt Lake to that city. The Emma was one of the heavy producers in the old days of Alta, and is credited with some of the richest silver ore ever found in Utah.

Tooele County

Cliff—Work is being pushed at this property at Ophir, and two inclined shafts are being sunk from the lower tunnel. An electric hoist has been installed, and one of the shafts has followed ore for some distance, which in places is from 6 to 8 ft. thick. On the 100-ft. level an orebody has been developed for 125 ft. There are three main tunnels 1700, 2000 and 2700 ft. long, which are situated high up on the north side of Ophir cañon. A steady tonnage is being shipped to the International. During May the shipments averaged a little over a car per day.

Lion Hill Consolidated—Several shipments of silver ore of good grade have been made recently from the Chloride Point workings. The ore is being taken from the Chloride Point incline and is stated to have been opened for 12 or 15 ft. From four to five cars are being shipped per month. A car lot of 41 tons, marketed recently, gave smelter returns of $4391. Other cars brought $1526 for 45 tons. This carried 85 oz. silver, $3.20 gold, and 4.8 per cent. lead. Another car of 45 tons ran 114 oz. silver and $3.60 gold, and brought $1962. The company owns about 600 acres on Lion hill and is controlled by Boston and Salt Lake interests.

Silver Island Coalition—A small force of men is at work on this property, 15 miles from Wendover. Good lead-silver ore has been encountered and it is expected to ship during the coming month. The company was formed to absorb the Haphazard and other claims, but the ground has reverted to the original owners.

Mayflower Consolidated—A contract has been let for sinking the 200-ft. incline to the 250-ft. point at this property in the Stansbury range near Grantsville. Iron ore carrying a small amount of silver and gold is being developed.

Washington

Okanogan County

A company, headed by Dr. D. C. Whipple, of Conconully, has been organized for the purpose of building a smeltery at Ruby.

Mill Mountain—This company is considering the installation of a stamp mill. H. McLean, Conconully, is president.

Snohomish County

Washington-Iowa Copper—E. P. Hewitt, Index, manager of this company, is making arrangements for active development work on its property on Silver creek.

Siberia—This company is making preparations to start work on its property on Silver creek. L. L. Johnson, Index, will have charge.

Wisconsin

Frontier—The mine at Benton continues to ship its concentrates to the Grasselli Chemical Company in West Virginia. A strike made recently at the Adam & Eve shaft shows about 8 ft. of high-grade jack.

Lucky Twelve—A roasting and magnetic-separating plant is to be erected at this mine.

Mack—A strike is reported on the Thompson land worked by this company at New Diggings.

Winskill—Under the management of the Wisconsin Zinc Company, this mine at Shullsburg is producing from 12 to 14 cars of concentrates per month.

Baxter—This mine at Cuba has completed its new mill. Electric power will be used.

Vinegar Hill—The company has leased the Hodge mine at Platteville and will reopen it.

Wyoming

Crook County

Hutchins Consolidated—The company has asked for bids for sinking a new shaft 100 ft. A shaft house is being erected and hoisting machinery installed. Development work is also being done.

Bear Lodge—Work is being pushed on the Daisy group of claims. The shaft is 190 ft. deep and crosscutting to determine the width of the vein is now in progress. The shaft is equipped with a steam hoist and air drills.

Last Chance—On this group of claims, worked by the Bear Lodge Gold mining company, there is a two-compartment shaft 60 ft. deep. This will be used for working the large vein opened in the incline tunnel.

Retriever—The company owns nine claims adjoining the Bock and Bear Lodge properties. Clark Allen is manager.

Canada

Nova Scotia

Port Hood Colliery—This mine has been flooded by water pouring in at the rate of 3000 gal. per min. from the Atlantic ocean. It will be abandoned as there is little hope that it can be pumped out. The property is owned by the Port Hood & Richmond Railway and Coal Company.

Ontario—Cobalt

The shipments from Cobalt for the week ended June 23 were: La Rose, 203,910 lb.; McKinley-Darragh, 180,700; Coniagas, 117,500; Cobalt Lake, 68,600; Crown Reserve, 67,200; City of Cobalt, 64,200; Nipissing, 63,600; Hudson Bay, 63,300; Buffalo, 56,160; total, 885,170 pounds. Bullion shipment, Nipissing, 43,334 ounces.

Nipissing—A new vein of ore has been struck in a crosscut at the 100-ft. level from the No. 123 shaft. No. 12 shaft has been pumped out and some good ore is being extracted.

Trethewey—The capitalization of this company has been increased from $1,000,000 to $2,000,000.

Nova Scotia—The new oreshoot cut at the 150-ft. level is about 40 ft. long and 4 ft. wide and is yielding good ore. The vein has also been discovered on the surface.

Millerett—The new stamp mill is in operation at this Gowganda property and when in regular order will handle 40 tons per day. The company has made another shipment of 22 tons of ore which will run about 1000 oz. per ton.

Wettlaufer—Manager Cushing H. Smith has decided to erect a 10-stamp mill to treat the ore on this South Lorrain property.

Bellellen—An oreshoot has been opened on the 100-ft. level of this South Lorrain property. Arrangements have been made with the Keeley mine to supply air for underground operations.

Kerry—Good ore has been found in this Peterson Lake lease.

Otisse-Currie—Steps are being taken by some of the share holders to inquire into the demise of this company which is situated near Elk Lake.

Ontario—Lake of the Woods

Dorion-Beaudry—On this property, which is an island 15 acres in area, development has met with promising results. Good ore was found on the surface and a shaft has been put down 55 ft. in the bottom of which samples were cut that gave fair assays.

Ophir—Development is yielding encouraging results. Two drifts are being run at the 35-ft. and 100-ft. levels. The former is in 25 ft. and the rich streak on the hanging wall is about 30 in. wide. In the 100-ft. drift similar conditions prevail, the best ore being found along the footwall. Visible gold is frequent along both walls.

Ontario—Porcupine

Preston-East Dome—A 15-ft. vein has been found on one of the properties of this company adjoining the Dome. It will be explored immediately.

Bewick-Moreing—The syndicate has established camps 3 and 4 and started prospecting on the claims north of the Dome Extension and also in Deloro. Camp 3 is situated on the properties adjoining the Dome Extension to the north and east and camp 4 on the Timmins group in Deloro.

Achilles—On this property, situated to the north of Porcupine lake, visible gold occurs in a quartz vein 7 ft. wide at the 125-ft. level.

Armstrong-Booth—An important surface discovery has been made on claim 13,065, consisting of a number of rich parallel stringers. Panning shows visible gold in the formation along the vein.

Porcupine Investors, Ltd.—This company, organized in London, England, with a capital of $1,500,000, has entered the Porcupine field and has purchased 120 acres, including the Alliston, Kahle and Joslin claims north of the Dome and East Dome properties and east of the Rea. Contracts are being let for drilling.

Porcupine-Canada Gold Mines, Ltd.—The company has been organized in Berlin and London by Baron G. von Polenz, who recently acquired several Porcupine properties. It is capitalized at $1,000,000. Engineers are now in the camp examining claims, on which the company holds options.

Foley-O'Brien—A recent report credits the finding of about 23 ft. of low-grade milling ore in the crosscut at the 160-ft. level.

Quebec

Missisquoi Marble—The work of getting out 65,000 sq.ft. of marble has commenced at the company's quarries, at Philipsburg. The marble will be used for the construction of the Mount-Royal hotel, Montreal.

Mexico

Press despatches state that laborers are striking throughout the country. The smelteries at Mapimi, Torreon, Chihuahua and Aguascalientes are affected. The strikes are the result of a widespread impression that the success of the revolutionists would result in an immediate increase of wages.

Chihuahua

La Republica—During May, 1167 tons of ore crushed yielded 72,637 pesos; operating charges were 48,281 pesos; construction charges 4562 pesos.

Soledad—This property of 85 acres was sold by Emilio Broniman of Santa Eulalia. At present the gold ore contains 1 to 4 per cent. copper but indications are that the copper will disappear at no great depth.

El Rayo—A new vein called the Comet, was opened by a crosscut from the upper San José tunnel and has been drifted in for a distance of 200 ft. The company operated to full capacity during the revolution.

Jalisco

Amparo—This company continued production throughout the revolution. The only inconvenience experienced resulted from the order of the Mexican Express Company against handling bullion and money. The bullion was deposited in a Guadalajara bank until the rescinding of the order made possible shipment to the Mexico City refinery.

Consolidated Mining Company—Shipments of high-grade ore from the Casados mine in the Hostotipaquillo district brought enough to pay operating expenses. A 150-ton reduction unit is being worked. This mine was the first to use electric power from the Chapala company.

Tajo—A hydroelectric plant is being built to utilize water flowing from one of the mine tunnels.

Amajac Mines Company—The company has opened rich ore in its Hostotipaquillo district properties, and has continued the work of remodeling the old Amajac reduction works.

Marquetas—The reduction plant in the Hostotipaquillo district, built by the Virginia & Mexico Mine & Smelter Company, has been leased by the Espada Mines Company, and a contract has been let for an aërial tramway to give the Espada mines connection with the mill.

Magistral Ameca Copper Company—This company in the Ameca district, shut down its new concentrating plant several months ago, pending remodeling and enlargement. Arrangements had been made for the investment of French and Mexican capital, but disturbed conditions interfered with the plans and later, mine work was stopped. Now it is stated that the adjustment of details alone stands in the way of the expected investment.

Cinco Minas—Work was suspended a few months ago, pending arrangements for power. Since that time steps have been taken that may result in a change of ownership. The mines are controlled by the Marcus Daly estate.

South America

Chile

Braden Copper Company—Work on the new concentrator is being rushed, and it is expected that the first unit will be put in operation this month. The other two units should be placed in commission early in the autumn, one in September and one in November, so that before the end of the year the property should be treating 3000 tons per day.

The Markets

Coal Trade Review

New York, July 5—Coal trade in the West is hesitating. Many are looking forward to a better business before July closes, and this view has its attractions. No increase in prices can be expected, however, as long as there is so great a surplus of producing capacity. Any advance would be the signal for an increase in shipments.

In the East the seaboard bituminous trade is looking rather better. There seems to be some increase in sales and an improving demand.

The anthracite trade is steady and quiet, with no incident and few variations.

Coke Rates—The Interstate Commerce Commission has vacated the suspension order against the coke rates from the Connellsville region and West Virginia to Chicago, and they will take effect July 15. The new rate is $2.50 on all coke; the old rates were $2.35 on blast-furnace coke and $2.65 on foundry and other coke. The rate to Toledo is $1.95; to Detroit, $2.10 per ton.

Coal Traffic Notes

Coal shipments over the Virginian railway, 11 months of fiscal year, from July 1 to May 31, short tons:

	Commercial	Company	Total
Coal	1,910,277	161,153	2,071,430
Coke	10,538	.....	10,538
Total	1,920,815	161,153	2,081,968
Total, 1909-10	886,176	.....	886,176

Company coal was not reported separately in 1909-10. The road was only partially opened in that year.

Coal shipments reported by the Southwestern Interstate Coal Operators' Association, four months ended April 30, short tons:

	1910	1911	Changes
Missouri	935,776	822,259	D. 113 517
Kansas	1,781,375	1,579,236	D. 202,139
Arkansas	818,089	431,465	D. 386,624
Oklahoma	1,016,294	757,788	D. 258,506
Total	4,551,534	3,590,748	D. 960,786

In April, 1910, shipments were entirely stopped by the general strike of the mines. The reports cover about 90 per cent. of the mines in the States named.

New York

Anthracite

July 5—The market is quiet this week locally, the holiday interfering very much with business. At the collieries several companies have closed down for the week, others for three or four days.

Schedule prices for July are: $4.55 for lump, $4.80 for egg and stove, and $5.05 for chestnut; all f.o.b. New York harbor. On steam sizes quotations are: Pea, $3@3.25; buckwheat, $2.30@2.75; No. 2 buckwheat or rice, $1.80@2.25; barley, $1.45@1.70; all according to quality, f.o.b. New York harbor.

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Bituminous

Business is looking a little better. Harbor trade is a shade more active, and coastwise business is also picking up a little. All-rail trade, however, is rather slow. Mines continue to keep pretty well down to orders, and there is little surplus at tide. The Lake trade is taking coal quite freely, both from Pennsylvania and West Virginia.

Prices are about the same, but the market has a firmer tone. A good Miller vein steam coal costs $2.50, f.o.b. New York harbor; lower grades sell down to $2.30 and better up to $2.85. Gas coals bring $1.10@1.15 for ¼-in., $1@1.05 for run-of-mine, and 70@80c. for slack, all at mines.

In the coastwise trade there are plenty of boats and rates are weak. Going rates from New York are 55@60c. to Boston and Portland, with 5 or 10c. added to the shoalwater ports; 35c. to Providence and Fall River; 25c. to Sound ports. From Philadelphia to Boston and Portland tonnage can be had at 60@65c. From Norfolk to Boston 60@70c. is charged.

Birmingham

July 4—The coal production in Alabama is still under normal. There are orders being received by the coal operators daily but delivery in the main will not start until August or perhaps a little later. When once the delivery on orders booked or in sight start, there will be a great activity at the mines throughout the district. The Tennessee Coal, Iron and Railroad Company has started up three more mines this week and others of this company will be put on full time; but other companies in this district have not secured business yet to bring about an immediate resumption. Coal prices have been weak in this section and it is understood that some of the railroads in placing business for delivery during the latter part of this year demanded close figures for the product.

The coke trade in Alabama shows improvement. The local consumption is picking up while the open market demand is better. Nearly 1000 coke ovens will be placed in operation between July 1 and 10 in this State.

Chicago

July 3—With business light and shipments kept down to the actual needs of the market on Western coals, coal dealers are talking about the possibilities of the autumn trade. Extraordinary heat has had an effect on the market; it has kept consumers and retailers from the thought of future needs and has made trade languid. From the harvest fields there continues to come a demand for coal, which does much to keep the market on an even keel. For steam-making purposes the only sales of consequence are screenings. A war of price cutting in the retail field has affected chiefly smokeless run-of-mine and has made that coal very low priced, though this does not affect a large part of the Chicago trade. The general slackening of business due to summer conditions and depressed markets in some lines leads to light consumption of coal almost everywhere.

Illinois and Indiana coals, on cars, bring $1.90@2.30 for lump, $1.65@1.85 for run-of-mine and $1.65@1.85 for screenings. Coals from east of Indiana are in general depressed. Hocking holds to $3.15 on sales of light tonnage; smokeless run-of-mine has sold as low as $2.85, the circular price being $3.15, and it still can be bought for less than $3; smokeless lump and egg are cut only slightly from the circular price of $3.55 and are firm compared with run-of-mine, though not in active demand. Anthracite sales are light, the end of the month bringing few sales at the June prices.

Cleveland

July 3—The Lake trade is going well now, and contract vessels are getting their cargoes freely. There is some demand for small boats to go to the shallow ports.

Local trade is quiet. Prices are unchanged, except that slack is now plentiful and can be had at a lower price. Pocahontas is in better supply.

Indianapolis

The coal-mining industry in Indiana is proceeding upon the belief that in July the business will revive to normal summer condition. Already there is an upturn in the trade, the buying for future delivery showing a gradual increase. These, and other indications of a revival in the coal business have occasioned the resumption of mining in at least four mines in the State that have been shut

down for some time. The Indiana operators are optimistic and confident.

Pittsburg

July 3—Lake shipments to July 1 have been the smallest for years, partly due to light demand, but chiefly to light vessel movement. As noted in last report, some vessels have been carrying out their contracts to take coal up, although they are not getting the expected return cargoes of coal, and the very curious development has been seen of vessels actually taking wild cargoes at the 30c. rate even though there was little prospect of getting a return cargo of ore. This has been in cases in which the vessels had gotten their organizations together and would lose still more if they did nothing at all. Local demand for coal has been extremely light, many manufacturing plants closing for repairs and inventory. Prices are on the same basis as formerly, and we continue to quote: Nut, $1.05@1.15; mine-run, $1.10@1.15; ¾-in., $1.20@1.25; 1¼-in., $1.30@1.35; slack, 60@75c. per ton at mine.

Connellsville Coke—Some sales of furnace coke in addition to those reported last week have been made. Two interesting furnace-coke contracts for the half year involve 9000 tons a month at $1.65 and 11,000 tons a month at $1.75, the latter being a particularly good grade of Old Basin coke. A large merchant-furnace interest has bought a total of about 100,000 tons for the half-year, about half of this being for July and August delivery and the other half for the remaining four months. Prices paid are understood to have been low, not over $1.65 for the coke running through the six months, and $1.50@1.55 for the coke for July and August only. The second-half market is now well established, at about 10c. per ton below the early asking prices of operators, but there is not much more business to be covered. The prompt market has stiffened materially, due entirely to the purchases of a single interest, which produces and consumes coke, but has had a strike at one of its mines and has been buying an average of 25 cars a day or more, picking up all the demurrage and other cheap coke available, so that there is nothing to be had below $1.50. We quote: Prompt furnace, $1.50@1.55; contract furnace, second half, $1.65@1.75; prompt foundry, $1.90@2; contract foundry, $2@2.25; per ton at ovens.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ended June 24 at 273,422 tons, a gain of 2000 tons, and shipments at 3046 cars to Pittsburg, 4742 cars to points West and 644 cars to points East, a total of 8432 cars.

St. Louis

July 3—The weather has been intensely hot during the past week, which, together with the holiday, has caused very little interest to be shown in the coal trade and orders have been correspondingly light.

The tonnage of coal will undoubtedly be much lighter during the ensuing week also as the majority of mines will remain closed down from July 1 to 6, inclusive, as the average miner will be doing too much celebrating to show up for work this week. The feature of the week has been the letting of the city contracts for the municipal institutions, all of which, excepting the workhouse, are wagon-lot propositions. The bids called for approximately 50,000 tons of coal and were awarded at from $1.76 to $1.90 for 2-in. forked lump coal; $5.10 for coke.

On July 2 the top works of the Massie mine, at Belleville, Ill., burned down. The loss is estimated at about $15,000. The mine was operated by the Wilharmil Car Company, of which R. W. Ropiequet is president. The output of the mine, which is about 600 tons per day, was disposed of by the St. Louis Coal Company. Work on the new top works will be started at once and it is hoped that the mine will again hoist coal during the course of the next six weeks.

The spot market on coal remains unchanged, though screenings seem a trifle weaker.

Anthracite—There was quite a little rush of anthracite business during the last week of June and the tonnage for the month was about normal. Shippers are still behind on the larger sizes though chestnut is abundant and hard to move.

FOREIGN·COAL·TRADE

United States Coal Imports—Imports of bituminous coal and coke into the United States, five months ended May 31, long tons:

	1910	1911	Changes
Bituminous	756,422	617,130	D. 139,292
Coke	46,467	40,351	D. 6,116
Total	802,889	657,481	D. 145,408

Anthracite imports are not reported; they amount to only a few tons. Canada supplied this year 507,963 tons of coal and nearly all the coke; Australia, 79,196 tons coal; Japan, 25,021 tons of coal. Imports are chiefly on the Pacific Coast and in the border States of the Northwest.

United States Coal Exports—Exports of coal from United States ports, with coal furnished to steamships in foreign trade, five months ended May 31, long tons:

	1910	1911	Changes
Anthracite	1,280,024	1,365,480	I. 85,456
Bituminous	3,446,063	4,266,575	I. 820,512
Total exports	4,726,087	5,632,055	I. 905,968
Steamer coal	2,605,734	2,686,041	I. 80,307
Total	7,331,821	8,318,096	I. 986,275
Coke	374,904	417,919	I. 43,015

Canada took this year, 4,203,676 tons of coal, or 74.6 per cent. of the total. The coke went chiefly to Canada and Mexico. Cuba and the West Indies took 644,824 tons of coal.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of coal on June 21, as follows: Best Welsh steam coal, $4.44; seconds, $4.02@4.14; thirds, $3.84@3.90; dry coals, $3.84; best Monmouthshire, $3.72; seconds, $3.54; best small steam coal, $2.64; seconds, $2.34. All prices are per long ton, f.o.b. shipping port, cash in 30 days, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, July 5—This is an off week, largely on account of the holiday; but the trade is inclined to be more hopeful still. The fact that a fair business is being done, although this is usually a dull season, is considered encouraging. This week is stock-taking time at most plants, and the stoppage may extend over a week more; but probably it will not be longer than usual, except at a very few plants.

In pig iron there have been some fair orders. The Burden Iron Company, of Troy, N. Y., has taken 30,000 tons of special iron, low in phosphorus and sulphur. Pipe works have taken a good deal of iron; otherwise orders have been mainly of the small class, so familiar of late.

The finished-material orders have not increased much. Little has been done this week in structural steel. The Canadian Pacific has taken 30,000 tons of steel rails from the Steel Corporation. There have been other orders for rails, mostly small, and some for cars. Small business is rather light.

The Jones & Laughlin Steel Company has cut loose from the jobbers and is establishing its own stores at Detroit, St. Louis and Cleveland. This seems to be part of a general movement.

Baltimore

July 3—Exports for the week included 672,029 lb. lead. Imports included 230 tons ferromanganese from Liverpool; 5500 tons manganese ore from Brazil; 6600 tons manganese ore from India; 11,000 tons iron ore from Cuba; 7909 tons iron pyrites from Huelva, Spain.

Birmingham

July 4—Southern manufacturers of iron are looking for activity in the iron market during the month of July and the belief is expressed that the sales will aggregate sufficiently by the end of the month to warrant consideration of additional blast-iron furnaces. The quotations are at low mark, $10 per ton for No. 2 foundry being heard of on all sides. Some inquiries have been received here for iron to be delivered during the first quarter in 1912 but manufacturers are

not looking for any of that business and no sales are being considered. A number of inquiries for iron for delivery during the last half of the year are being given consideration. The Tennessee Coal, Iron and Railroad Company will blow in two furnaces during the first week in July but these will produce basic iron to be used at the steel plant. The activity at the big steel works of this company has caused a general revival among the industries of that corporation, coal and ore mines, numbers of coke ovens and other works being started up to supply material. The steel plant of the Tennessee company is to produce 25,000 tons of steel per month, the greater portion of it to go into rails. It is understood that contracts are in hand that will warrant a steady operation of the plant until October at least and negotiations on other deals are about to be consummated which means business through the balance of the year. There is a strong demand for fabricated steel and as a consequence the Tennessee company's rolling mills at Bessemer are on full time. The works of the Southern Iron and Steel Company are not doing much at Gadsden.

The cast-iron pipe trade is active also and orders are in hand or in sight that will cause steady operations at works during the balance of the year. It is believed that negotiations whereby the United States Cast Iron Pipe and Foundry Company takes over the plant of the Dimmick Pipe and Foundry Company will be concluded during this week.

Chicago

July 3—Sales of pig iron have been good in the last week, as compared with previous weeks, the increased demand coming very generally from foundries. Actual sales are mostly for the third quarter; inquiries are large for second-half requirements, showing that there is much prospective tonnage. The total tonnage of sales is not large compared with a record of really heavy business, however, and it does not seem likely to become large soon. The sales of the last two weeks apparently indicate that melters are getting caught up with their supplies and are buying for actual needs. Northern No. 2 iron sells for $15@15.25 and Southern at $10@10.25, Birmingham, which means $14.35@14.60, Chicago.

General business in iron and steel products is quiet, with the demand best in the lighter lines. The revival of business is shown in the increased demand for coke, which is moving well at $4.75. A tone of confidence seems to exist among the sellers of pig iron and melters are displaying more interest with the lessening evidences of overproduction by local furnaces.

Cleveland

July 3—No new sales of iron ore are reported. Shipments continue light.

Pig Iron—A little more business is reported, but the market cannot yet be called active. Quotations, Cleveland delivery, are $15.90 for bessemer, $14.25 for No. 2 foundry, $14.35 for No. 2 Southern, $17.50 for Lake Superior charcoal.

Finished Materials—There is a moderate improvement in new orders on almost all lines. Specifications on contracts are coming in more freely.

Philadelphia

July 5—Quite a large volume of business has been somewhat unexpectedly transacted in pig iron during the past few days and the negotiations now going on will transfer a large quantity of pig to buyers' account. Eastern Pennsylvania furnaces have picked up large business in foundry grades for local and New England delivery. So many options have been given at low prices that the makers will not profit by the possible improvement. Their present anxiety is to get out of the hole they have been in for months and they will welcome every order they can get. The larger consumers are talking about deliveries to come the balance of the year. The furnace people will take such long deliveries if they can do no better, but they prefer shorter time. Special grades of foundry for near delivery are getting scarce. No. 24 is $15.75; gray forge, $14.75, and basic, $15. But little has been done in Southern irons. Machinery, tool and engineering plants are in the market and all want iron.

Steel Billets—Outside market conditions have been reflected in this market favorably and a fair sized volume of long pending business will be promptly closed on terms very favorable to buyers.

Bars—The improvement felt in other branches is absent in bars, but the heavy orders for cars just placed will help directly or indirectly, the bar mills of this territory.

Sheets—The sheet mills have succeeded in securing more business the past week than for some time.

Pipes and Tubes—Merchant pipe is dull; business in cast-pipe lines is growing. Some delayed orders for cast pipe will be placed before Saturday. No new developments in tubes.

Plates—A sharp increase in orders, mostly for early delivery, is the event of the past few days. The placing of larger orders for cars and bridges is reflecting favorably on plate mill conditions. Additional ship-yard work is showing up.

Structural Material—Eastern bridge and construction requirements have been covered by orders, mostly for early delivery. Local construction business is improving and the general tone of the market is stronger than a week ago. A steady run of business is looked for.

Scrap—The only noticeable improvement is a few inquiries for heavy steel and No. 1 yard scrap. The ready supply of both kinds is light.

Pittsburg

July 4—In some quarters it is held that the improvement in finished-steel orders which began early in June was started chiefly by consumers who wished to work up material in anticipation of closing for repairs and inventory. In such case the June improvement would not be the beginning of a long continued movement, and the dullness of the market in the past few days lends color to this diagnosis. A great many men will be away on vacation this month and perhaps next, and no continued improvement is likely at this time, so that a dull July is to be expected. Later, in August or early September, it is the general belief that a continued improvement will set in, carrying the trade to a level of greater activity than any experienced for a twelvemonth. It is improbable, however, that anything will develop which will test the productive capacity of the mills.

The Amalgamated Association wage scales, sheet, tinplate and iron, are all settled for the year beginning July 1 on the basis of the old rates, and the Sons of Vulcan settlements, made individually with the mills recognizing this organization of puddlers, will doubtless be made without difficulty. The union control of iron mills in the Central West is nearly complete, but the control of sheet and tin mills is limited to about 40 per cent. of the independent capacity and does not extend to the Steel Corporation's mills at all. For several weeks there has been quiet talk in some quarters that the iron trade would have to have general wage reductions, but no evidence is obtainable in responsible quarters that wage reductions are contemplated by those with authority to make such decisions.

Pig Iron—Quiet inquiries have appeared for a total of about 60,000 tons of basic iron, about half from the East and half from the West. It is as yet problematical whether this will result in any large business, but there is no doubt that consumers are somewhat more anxious than they were, as the merchant furnaces which were running at a loss, based on purchased ore and coke, have pretty well cleaned up the stocks of ore and have bought very sparingly indeed of this season's ore. As a consequence they are going out of blast. Altogether nine or 10 furnaces have gone out within the past 30 days or will go out within a fortnight, including Cherry Valley at Leetonia, Mattie at Girard, Tod and Struthers in the Mahoning Valley, Shenango No. 1 in the Shenango Valley, Upson at Cleveland, and one each Buffalo Union, Wickwire and New York State in the Buffalo district. Some of these went out simply

because they had worked up their ore and were not getting fresh supplies. Shenango No. 1 went out for repairs and enlargement, a few feet to be added to the hight and the breadth of hearth to be increased, without change in the maximum bosh diameter. It is possible, in these circumstances that after a declining market in the local and Valley market for fully 18 months a slight upturn may occur within a few weeks. Two sales of bessemer aggregating 350 tons have been made at slight cuts from $15, Valley. These were made by middle interests, and the furnaces still quote $15 for large lots. The bessemer average for June is announced at $15, Valley, $15.90, Pittsburg, where it has practically stood for 10 months. The basic average will not be announced until Wednesday. We quote, f.o.b. Valley furnaces, 90c. higher delivered Pittsburg: Bessemer, $15; basic, $13@13.25; No. 2 foundry $13.50@13.75; malleable, $13.25@13.50; gray forge, $13@13.25 per ton.

Ferromanganese—A sale of 200 tons of prompt ferromanganese is reported at $36.50, Baltimore. We quote the prompt and forward market at this figure.

Steel—June specifications on sheet bar contracts were much larger than May specifications, but billet specifications showed little if any improvement, and specifications are expected to be lighter this month. Sales in the open market amount to practically nothing. We quote bessemer and open-hearth billets at $21 and sheet bars at $22, f.o.b. maker's mill, Pittsburg or Youngstown, with rods at $27, Pittsburg.

Sheets—As a result of the better buying which developed within a few days after the $4 a ton cut in sheets May 29 the sheet mills have run better in the past fortnight than since early in the year, averaging between 60 and 75 per cent. of capacity. Some of the business booked was for slightly forward delivery, and there is a fairly comfortable tonnage on books for this month's rolling. As a rule, however, the mills were not ready to obligate themselves upon far forward deliveries at the close prices now ruling. We quote: Black sheets, 28 gage, 2c.; galvanized, 3c.; blue annealed, 10 gage, 1.50c.; painted corrugated, $1.40; galvanized, $2.55 per square.

St. Louis

July 3—The demand for pig iron seems to be a little better, and while the contracts closed during the past week amount to very little, yet inquiries are more numerous. Prices remain the same, $1@10.25 per ton, Birmingham, or $13.75@14, St. Louis.

FOREIGN IRON TRADE

German Iron Production—The German Iron and Steel Union reports the make of pig iron in the German Empire in May at 1,312,255 metric tons, or 36,859 tons more than in April. For the five months ended May 31 the total was, in metric tons:

	1910	1911	Changes
Foundry iron	1,144,951	1,293,451	I. 148,500
Forge iron.....	280,476	233,307	D. 47,169
Steel pig.....	537,096	706,176	I. 169,080
Bessemer pig.....	206,110	142,878	D. 63,232
Thomas(basic)pig	3,814,328	4,043,830	I. 229,502
Total.....	5,982,961	6,419,642	I. 436,681

Total increase this year, 7.3 per cent. Steel pig includes spiegeleisen, ferromanganese, ferrosilicon and all similar alloys.

Foreign Trade of Austria-Hungary—Imports and exports of iron and steel in Austria-Hungary, year ended Dec. 31, metric tons:

	Imports.	Exports.	Excess.
Iron and steel....	198,537	198,501	Im. 36
Machinery.....	103,357	29,485	Im. 73,872
Total.....	301,894	227,986	Im. 73,908
Total, 1909.....	317,172	144,241	Im. 172,931

Imports of iron ore in 1910 were 382,402 tons; exports, 180,787 tons. Imports of manganese ore, 59,957 tons; exports, 285 tons.

METAL MARKETS

New York, July 5—The metal markets show no material change. Business has been somewhat interrupted by the holiday.

Owing to an error in reading the cablegram, the price of lead in London was given last week for from 26, 27 and 28, as £13 5/8, £13 5/8 and £13 11/16, respectively. The correct figures are £13 3/8, £13 3/8 and £13 7/16 for the three days.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold:			
May 1911..	$6,817,149	$ 5,014,740	Exp. $ 1,802,409
" 1910.	718,678	3,143,338	Imp. 2,424,660
Year 1911..	10,176,807	29,004,012	Imp. 18,827,205
" 1910..	47,918,384	14,812,614	Exp. 33,105,770
Silver:			
May 1911..	5,054,304	3,555,543	Exp. 1,498,761
" 1910..	4,130,754	3,354,715	" 776,039
Year 1911..	28,665,509	18,451,559	" 10,213,946
" 1910..	22,466,835	18,593,349	" 3,873,481

Exports from the port of New York, week ended July 1: Gold, $10,127; silver, $1,086,441, chiefly to Mexico. Imports: Gold, $68,487; silver, $32,981, from the West Indies, South America and Japan.

Gold—Prices on the open market in London were unchanged at 77s. 9d. per oz. for bars and 77s. 4½d. per oz. for American coin. Nearly all the supplies were taken by India and the Bank of England.

Platinum—The market is steady and no change in prices is reported. Dealers ask $42.50@43 per oz. for refined platinum and $45@45.50 per oz. for hard metal, 10 per cent. iridium.

Our Russian correspondent writes from St. Petersburg, under date of June 22, that the market has a strong tendency. Prices have advanced, especially for large quantities. From Ekaterinburg there is reported intense activity in the platinum mines. Four new dredges will be installed this summer. The quotations are: at Ekaterinburg, 9.30 rubles per zolotnik, nominal—equal to $34.97 per oz. In St. Petersburg business has been done at 35,800 rubles per pood—$35.08 per oz. These prices are for crude metal, 83 per cent. platinum.

Iridium—Prices are steady, $62 per oz. being asked for pure metal.

Silver—The market has ruled quiet and dull around 24 5/16d. in London; but closes higher at 24 7/16d. on buying by Indian Bazaars.

SILVER AND STERLING EXCHANGE

June-July	29	30	1	3	4	5
New York....	52¾	52¾	52¾	52⅝	.....	52⅝
London ..	24 7/16	24 7/16	24 3/8	24 7/16	24 7/16	24 7/16
Sterling Ex..	4.8620	4.8610	4.8605	4.8610	.....	4.8605

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

The coinage of the British Mint for the year 1910 was as follows:

Pieces.	Imperial.	Colonial.	Total.
Gold.....	27,403,505	.....	27,403,505
Silver.....	51,820,323	11,916,000	63,736,323
Nickel.....	.....	18,744,509	18,744,509
Bronze.....	42,917,504	.....	42,917,504
Total pieces...	122,141,332	30,660,509	152,801,841

The face value of the Imperial coins was £25,300,000 gold, £2,520,591 silver and £151,452 bronze. There was £2,700,000 in gold coins withdrawn as light weight and melted down.

Copper, Tin, Lead and Zinc

NEW YORK

June-July	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
29	12⅝ @12⅞	12 50 @12.60	43¼	4.47½ 4 50	4.32½ @4.37½	5.65 @5.75	5.50 @5.60
30	12⅝ @12⅞	12.50 @12.60	43⅛	4.47½ 4.50	4.32½ @4.37½	5.65 @5.70	5 50 @5 55
1	12⅛ @12⅜	12.45 @12.55	43¾	4.47½ 4.50	4.32½ @4 37½	5.62½ @5.67½	5 47½ @5 52½
3	12⅝ @12¾	12.45 @12.50	43	4.47½ 4.50	4.32½ @4.37½	5.62½ @5.67½	5 47½ @5 52½
4	.....	.....	....	....	.....	.....	.....
5	12⅝ @12¾	12 45 @12 50	43¼	4.47½ 4.50	4 32½ @4 37½	5 62½ @5 67½	5 47½ @5 52½

The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

June-July	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
	Spot	3 Mos	Best Sel'td	Spot	3 Mos		
29	56 1/8	57 1/8	60 3/4	197	190 1/8	13 3/8	24 3/4
30	57	57 3/16	61	195 1/8	190	13 3/8	24 3/4
1	.....	.....	.....	.....	.....	....	....
3	56 5/16	57 1/8	60 3/4	194 1/8	190	13 3/8	24 3/4
4	56 3/8	57 1/16	60 3/4	194 1/8	188 1/8	13 5/16	24 3/4
5	56 3/4	56 15/16	60 3/4	195 1/2	188 3/4	13 5/16	24 3/4

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £12 = 2.61c.; £23 = 5c.; £60 = 13.04c. ± £1 = ± 0.21¾c.

Copper—The continued absence of orders from consumers is beginning to have its effect upon the London standard market, where prices have been slowly but surely receding from day to day. In order to take advantage of arbitrage opportunities, electrolytic copper is now being offered at somewhat lower prices, particularly in Europe. For domestic delivery electrolytic has been freely offered at 12⅝c., delivered, 30 days, and some transactions have been made at that price. The close is easier at 12⅝@12¾c. for Lake copper, and 12.45@12.50c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 12¼@12⅜ cents.

The London standard market had receded at the close to £56 7s. 6d. for spot, and £56 18s. 9d. for three months.

Copper sheets are 18@19c. base, for large lots. Full extras are charged and higher prices for small quantities. Copper wire has been advanced ¼c. and is now 14c. base, carload lots at mill. This price is shaded, however, orders being taken at 13¾c. quite freely.

Exports of copper from New York for the week were 2922 long tons. Our special correspondent gives the exports from Baltimore for the week at 380 tons.

Stocks of copper in England and France, July 1—including 8750 tons afloat from Chile and Australia—were 70,170 long tons. Stocks in Rotterdam, 7200; in Hamburg, 10,100 long tons. Total stocks 87,470 tons, a decrease of 500 tons from the June 15 report.

A metal exchange, especially for transactions in copper, has been established in Berlin.

Tin—The London market throughout last week was rather irregular. The Syndicate seems to be playing a waiting game, putting down the market when some holdings have to be liquidated, but otherwise keeping prices steady with little change. Transactions remained insignificant. The domestic market had a holiday appearance. Spot material is still scarce and firmly held, but large shipments which are on the way to New York may soon alleviate the situation. The market closes dull in London at £195 10s. for spot, and £188 15s. for three months, and in New York at about 43¼c. for July.

Visible stocks of tin, July 1, were: Great Britain, 12,692; Holland, 1261; United States, excluding Pacific ports, 2652; total, 16,605 long tons, an increase of 667 tons over June 1.

Lead—Business has been of somewhat lighter volume than during previous weeks, but prices are well maintained at 4.45@4.50c. New York, and 4.32½@4.37½c. St. Louis.

The London market is steady at £13 6s. 3d. for Spanish lead, and £13 8s. 9d. for English.

Spelter—Offerings have been on a more liberal scale, and as the absorption on part of the consumers has been relatively light, prices have given way slightly, the close being barely steady at 5.62½@5.67½c. New York, and 5.47½@5.52½c. St. Louis.

The London market remains firm at £24 15s. for good ordinaries, and £25 for specials.

Zinc dust is 6⅞c. per lb., New York.

Base price of zinc sheets is $7.50 per 100 lb., f.o.b. La Salle-Peru, less 8 per cent. discount.

Silesian Spelter Market—Paul Speier writes from Breslau, Germany, under date of June 22, that the market is strong. Quotations for ordinary brands are 49.50 marks per 100 kg., f.o.b. works—equal to 5.34c. per lb. Zinc sheets are higher, quotations being 58.85@60.85 marks per 100 kg., f.o.b. rolling mills—average, 6.46c. per lb. Zinc dust is quoted at 45.50@46.50 marks per 100 kg.—average 4.95c. per lb., delivered at Stettin.

Other Metals

Aluminum—No change in the market is reported and business is quiet. Quotations are 20@20¼c. per lb. for No. 1 ingots, New York.

Antimony—Business is still quiet and sales light. Cookson's is held at 8.50c. per lb. and Hallett's at 7.75c., while 7.25@7.50c. is asked for Hungarian, Chinese and other outside brands.

Quicksilver—Spot supplies are still rather light. The market is quiet and prices are unchanged. New York quotation is $44, to arrive, per flask of 75 lb. San Francisco, $43.50@44 for domestic orders and $41@41.50 for export. London quotations are £8 7s. 6d. per flask, with £7 17s. 6d. named from second hands.

Bismuth—The current price of bismuth in London is 7s. 6d.—or $1.80—per pound.

Cadmium—This metal is quoted at works in Germany at 725@750 marks per 100 kg.—equal to 78.3@81c. per lb.—according to size of order.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York.

Nickel—Large lots, contract business, 40@50c. per lb. Retail spot, from 50c. for 500-lb. lots up to 55c. for 200-lb. lots. The price of electrolytic is 5c. higher.

Spanish Metal Exports

Exports of metals and minerals from Spain, four months ended April 30, reported by *Revista Minera*, in metric tons:

Metals	1910	1911	Changes	
Pig and manuf. iron	14,994	17,428	I.	2,43
Copper	4,647	3,770	D.	87
Copper precipitate	5,163	4,897	D.	26
Lead	59,512	46,925	D.	12,58
Zinc	646	581	D.	6
Quicksilver	825	523	D.	30
Minerals				
Iron ore	3,062,783	2,978,486	D.	84,29
Manganese ore	2,482	11,573	I.	9,09
Copper ore	312,231	159,838	D.	152,39
Lead ore	1,190	917	D.	27
Zinc ore	46,790	50,274	I.	3,48
Pyrites, iron	436,609	607,044	I.	170,43
Salt	160,216	179,745	I.	19,52

Imports of phosphate of lime, 41,323 tons in 1910, and 41,427 in 1911; superphosphates and basic slag, 41,640 and 34,480 tons; nitrate of soda, 19,611 and 20,176 tons.

Zinc and Lead Ore Markets

Platteville, Wis., July 1—The base price paid this week for 60 per cent. zinc ore was $42.50 per ton. The base price paid this week for 80 per cent. lead ore was $54@55 per ton. The net shipment of zinc ore for the first six months of 1911 showed a gain of 32,552,633 lb. over the corresponding period last year.

SHIPMENTS, WEEK ENDED JULY 1

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphu ore, lb
Platteville	1,170,650	.....	319,200
Mineral Point	907,160	.....	.....
Galena	652,700	.....	.....
Hazel Green	426,620	53,100	.....
Highland	320,600	.....	.....
Benton	174,500	51,100	.....
Rewey	81,100	.....	.....
Harker	61,880	.....	.....
Cuba City	.....	.....	404,950
Shullsburg	.....	59,800	.....
Livingston	.....	80,000	.....
Linden	.....	54,290	.....
Total	3,795,210	298,290	724,150
Year to date	74,404,309	4,463,135	17,481,310

Shipped during week to separating plants, 2,927,700 lb. zinc ore.

Joplin, Mo., July 1—The highest price paid for zinc sulphide ore was $45 per ton, the base ranging from $40 to $43 per ton of 60 per cent. zinc. Zinc silicate ore sold on a base of $20@22 per ton of 40 per cent. zinc. The average price, all grades of zinc, was $38.18. The highest price paid for lead ore was $59 per ton, with medium grades at $57 to $58. The average price, all grades of lead, was $57.04 per ton.

Buyers report buying easy all week on the opening quotations, with orders easily and quickly filled, and week-end offerings, for next week's delivery, were at lower prices. Orders were mainly for a decreased tonnage, but with the heavy shipment of ore recently purchased on contract the shipment for the week is kept well up to an average.

SHIPMENTS, WEEK ENDED JULY 1

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	3,734,940	.....	1,473,280	$118,420
Joplin	1,852,050	.....	303,360	47,615
Alba-Neck	759,640	.....	.....	15,952
Duenweg	631,790	156,310	.....	14,826
Granby	283,430	613,220	85,290	14,280
Galena	325,570	.....	134,110	10,496
Spring City	162,530	71,110	165,710	8,721
Miami	741,030	.....	.....	8,151
Oronogo	353,130	.....	.....	7,102
Carl Junction	147,060	.....	.....	4,115
Jackson	125,590	.....	1,970	2,566
Badger	123,140	.....	.....	2,463
Wentworth	128,520	.....	.....	2,313
Aurora	72,040	63,900	.....	2,144
Quapaw	65,210	.....	27,520	2,023
Cave Springs	63,620	.....	.....	1,336
Sarcoxie	57,290	.....	.....	1,088
Totals	9,626,580	904,540	2,191,240	$263,611
6 months	256,192,710	17,387,610	44,594,830	$6,469,109

Blende val., the week, $190,620; 6 mos., $5,024,014
Calamine, the week, 10,475; 6 mos., 202,510
Lead value, the week, 62,516; 6 mos., 1,242,585

MONTHLY AVERAGE PRICES

Month	Zinc Ore: Base Price		Zinc Ore: All Ores		Lead Ore: All Ores	
	1910	1911	1910	1911	1910	1911
January	$47.31	$41 85	$45.16	$40 55	$56.99	$55 68
February	40.69	40 21	39.47	39 16	53.64	54 46
March	43.60	39.85	39.71	38.45	51.26	54.77
April	41.00	38 88	39.33	37 47	49 72	56 37
May	40.19	38.25	37.51	36 79	48.16	55 21
June	40.20	40.50	37.83	38.18	48.80	56 49
July	39.63	.....	36.80	.....	48.59	.....
August	40.13	.....	37.32	.....	49.75	.....
September	43.45	.....	39.96	.....	54.73	.....
October	43.31	.....	40.50	.....	53.18	.....
November	47 20	.....	43 20	.....	54 80	.....
December	42.50	.....	40 70	.....	55.70	.....
Year	$42.43	.....	$39 79	.....	$52.12	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

New Caledonia Ores

Exports of ores from New Caledonia for the four months ended April 30 are reported by the *Bulletin du Commerce*, of Noumea, at 31,731 metric tons nickel ore and 6818 tons chrome ore. The chrome ore included 6400 tons for New York, direct. Exports of metals were 775 tons nickel matte and 567 tons copper matte.

Other Ore Markets

Pyrites—Domestic pyrites are quoted at 12@12½c. per unit of sulphur at mines fir furnace sizes; fines about 1c. less. Spanish pyrites, furnace size, are 13@13¼c. per unit, ex-ship. Arsenical pyrites are from ½@1½c. per unit less.

Tungsten Ore—Ferberite, wolframite and huebnerite ores, $6.50@7 per unit per ton of 2000 lb. of ore containing 60 per cent. of tungsten trioxide. For scheelite ore, 50c.@$1.50 per unit less.

CHEMICALS

New York, July 5—The general market is an example of midsummer dullness just at present.

Copper Sulphate—Demand is good and supplies are a little better. Prices continue firm at $4.50 per 100 lb. for carload lots and $4.75 per 100 lb. for smaller parcels.

Arsenic—Improvement in demand is not so marked this week, but prices are held, $2 per 100 lb. being asked for white arsenic for early delivery, and $1.75 per 100 lb. for futures.

Nitrate of Soda—Business in this article is good, and prices are firmer. Spot nitrate is still quoted at 2.12½c. per lb., while 2.15@2.17½c. is named for future positions.

Petroleum

Export of mineral oils from the United States, five months ended May 31, in gallons:

	1910	1911
Crude petroleum	55,981,450	53,787,563
Naphthas	36,727,607	42,117,328
Illuminating oils	380,733,570	444,264,460
Lubricating and paraffin	63,491,130	72,704,329
Residuum	43,623,996	52,894,760
Total	580,557,753	665,768,440

Total increase this year, 85,210,687 gal., or 15.5 per cent.

MINING·STOCKS $

New York, July 5—The market has been dull and quiet from the opening and this condition was intensified by extremely hot weather and by the holiday, which sent everyone out of town who could go. What trading was done was professional; the public has been concerning itself much more with the state of the thermometer than with Wall Street quotations.

The Curb was also dull. The trading in the copper stocks was light and irregular. Cobalt stocks were more active, Kerr Lake being especially strong. Other mining shares were rather neglected.

Boston, July 3—Copper-share prices have lost ground during the week. This is due to a lack of outside interest rather than to any large offerings of stocks. This market is in a waiting yet receptive mood and continues to be influenced by the fluctuations of Amalgamated, Smelters and a few others of the metal group.

For this reason prices have worked off some but not to any alarming extent.

North Butte and Calumet & Arizona have gone off the greatest amount in the week's transactions. The former fell $2.50 to $32.25 and Calumet & Arizona is off $4.75 to $57.25.

Curb trading brought no new developments. New securities continue to be listed here.

Superior & Boston directors have secured a loan of $200,000 from Hayden, Stone & Co. and have adopted a resolu-

COPPER PRODUCTION REPORTS
Copper contents of blister copper, in pounds

Company	April	May	June
Anaconda	21,500,000	22,100,000	21,850,000
Arizona, Ltd.	2,840,000	2,800,000	.....
Balaklala	880,921	978,426	.....
Copper Queen	6,933,422	7,140,196	.....
Calumet & Ariz.	3,850,000	3,854,000	3,656,000
Detroit	1,814,740	1,709,530	.....
East Butte	1,085,000	1,135,000	.....
Nevada Con.	5,298,632	5,277,355	.....
Old Dominion	2,535,000	2,363,000	.....
Shannon	1,258,000	1,229,760	1,098,000
South Utah	300,137	318,350	.....
United Verde*	2,500,000	3,000,000	.....
Utah Copper Co.	8,169,248	8,391,879	.....
Lake Superior*	16,000,000	19,000,000	.....
Non-rep. mines*	11,825,000	13,286,000	.....
Total production	86,790,100	92,577,496	.....
Imports, bars, etc.	25,655,122	19,481,190	.....
Total blister	112,445,222	112,058,686	.....
Imp. in ore & matte	5,207,484	6,801,365	.....
Total	117,652,706	118,860,051	.....
Brit. Col. Cos.:			
British Col. Copper	952,284	.....	.....
Granby	1,825,340	.....	.....
Mexican Cos.:			
Boleo	2,403,520	2,411,500	.....
Cananea	3,644,000	4,098,000	.....
Moctezuma	2,315,292	2,403,583	.....
Other Foreign:			
Spassky, Russia	506,240	586,880	.....
Exports from:			
Chile	5,152,000	7,392,000	.....
Australia	5,936,000	11,088,000	.....

Figures are reports received from companies, unless otherwise stated. Boleo copper does not come to American refiners.
*Estimated.

STATISTICS OF COPPER

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries, for Export
VI. 1910	127,219,188	53,363,196	65,895,948
VII	118,370,003	56,708,175	59,407,167
VIII	127,803,618	67,731,271	61,831,780
IX	119,519,983	64,501,018	75,106,496
X	126,469,284	67,814,172	68,186,917
XI	119,353,463	60,801,992	67,424,318
XII	123,339,219	43,594,018	88,104,075
Year 1910	1,452,122,120	749,426,542	722,431,494
I, 1911	115,696,591	42,078,567	53,208,739
II	109,828,297	50,518,998	45,111,019
III	130,532,080	66,080,789	59,081,127
IV	118,085,223	52,407,650	62,129,599
V	126,962,544	64,543,963	61,978,557
VI	.....	.....	.....

	Visible Stocks: United States.	Europe.	Total.
VII, 1910	168,386,017	232,892,800	401,278,817
VIII	170,640,678	222,320,000	392,960,675
IX	168,881,245	218,444,800	387,326,046
X	148,793,714	211,276,800	360,070,519
XI	139,261,914	198,060,800	337,322,711
XII	130,389,069	193,200,000	323,589,095
I, 1911	122,030,195	236,629,120	358,649,373
II	142,439,490	236,992,000	379,431,134
III	156,637,770	233,385,600	390,023,009
IV	162,007,934	223,014,400	385,022,434
V	165,555,908	212,284,800	377,840,708
VI	165,995,932	202,540,800	368,536,732
VII	.....	195,932,800	.....

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month. From Jan. 1, 1911, stocks at Hamburg and Rotterdam are included in the visible stocks for Europe.

tion providing that the capital be increased from 250,000 to 300,000 shares, the 50,000 new shares to have a paid-in value of $4.50 per share in keeping with the present outstanding part-paid stock. The company's offices will be removed to this city.

Assessments

Company	Delinq	Sale	Amt
Alta, Utah	July 13	Aug. 3	$0.05
Chollar, Nev	July 18	Aug. 10	0.10
Dennemora, Ida	June 26	July 26	0.002
East Hercules Extens'n, Id.	June 19	July 19	0.001
Humming Bird, Ida	July 7	Aug. 7	0.002½
Julia Con., Nev	June 29	July 27	0.05
Laclede, Ida	July 8	July 31	0.003
Lucky Calumet, Ida	June 24	July 24	0.005
Mass, Mich	June 15	.....	2.00
Melcher, Ida	June 27	July 19	0.02
Missoula Copper, Ida	June 5	July 19	0.01
Nine Mile, Ida	June 25	July 30	0.001
Old Colony, Mich	June 26	.....	1.00
Oreano, Ida	Aug. 1	Sept. 1	0.003
Sierra Nevada, Nev	July 21	Aug. 11	0.10
Silver Mountain, Ida	June 20	July 20	0.003
Snowstorm Extension, Ida.	June 22	July 24	0.003
Sonora, Ida	June 30	July 25	0.001
Temple, Ida	June 27	July 26	0.002
Trans.-Continental, Ida	June 30	July 22	0.002
Treasure, Cal	July 7	July 31	0.05
Tyler, Ida	July 7	Aug. 8	0.001
Union Con., Nev	July 12	Aug. 4	0.15
Utah Mining, Nev	July 10	July 31	0.05
Utah United Copper, Utah	June 24	.....	0.01
Wonderful, Ida	May 22	July 10	0.001

Monthly Average Prices of Metals

SILVER

Month.	New York.			London.		
	1909.	1910.	1911.	1909.	1910.	1911.
January	51.750	52.375	53.795	23.843	24.154	24.865
February	51.472	51.534	52.222	23.706	23.794	24.081
March	50.468	51.454	52.745	23.227	23.690	24.324
April	51.428	53.221	53.325	23.708	24.483	24.595
May	52.905	53.870	53.308	24.343	24.797	24.583
June	52.538	53.462	53.043	24.166	24.651	24.486
July	51.043	54.150	.....	23.519	25.034	.....
August	51.125	52.912	.....	23.588	24.428	.....
September	51.440	53.295	.....	23.743	24.567	.....
October	50.923	55.490	.....	23.502	25.596	.....
November	50.703	55.635	.....	23.351	25.680	.....
December	52.226	54.428	.....	24.030	25.160	.....
Total	51.502	53.486	.....	23.706	24.670	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	New York.				London, Standard.	
	Electrolytic		Lake.			
	1910.	1911.	1910.	1911.	1910.	1911.
January	13.620	12.295	13.870	12.680	60.923	55.604
February	13.332	12.256	13.719	12.611	59.388	54.970
March	13.255	12.139	13.586	12.447	59.214	54.704
April	12.733	12.019	13.091	12.275	57.238	54.035
May	12.550	11.989	12.885	12.214	56.313	54.313
June	12.404	12.385	12.798	12.611	55.310	56.368
July	12.215	.....	12.570	.....	54.194	.....
August	12.490	.....	12.715	.....	55.733	.....
September	12.379	.....	12.668	.....	55.207	.....
October	12.553	.....	12.788	.....	56.722	.....
November	12.742	.....	12.914	.....	57.634	.....
December	12.581	.....	12.863	.....	56.769	.....
Year	12.738	.....	13.039	.....	57.054	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

TIN AT NEW YORK

Month.	1910.	1911.	Month.	1910.	1911.
January	32.700	41.255	July	32.695	.....
February	32.920	41.614	August	33.972	.....
March	32.403	40.157	September	34.982	.....
April	32.976	42.185	October	36.190	.....
May	33.125	43.115	November	36.547	.....
June	32.769	44.606	December	38.199	.....
			Av. Year	34.123	.....

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1910.	1911.	1910.	1911.	1910.	1911.
January	4.700	4.483	4.582	4.334	13.650	13.009
February	4.613	4.440	4.445	4.266	13.328	13.043
March	4.459	4.394	4.307	4.238	13.063	13.122
April	4.376	4.412	4.225	4.262	12.641	12.889
May	4.315	4.373	4.164	4.223	12.550	12.984
June	4.343	4.435	4.207	4.292	12.688	13.260
July	4.404	.....	4.291	.....	12.531	.....
August	4.400	.....	4.290	.....	12.513	.....
September	4.400	.....	4.289	.....	12.582	.....
October	4.400	.....	4.271	.....	13.091	.....
November	4.442	.....	4.314	.....	13.217	.....
December	4.500	.....	4.363	.....	13.197	.....
Year	4.446	.....	4.312	.....	12.920	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1910.	1911.	1910.	1911.	1910.	1911.
January	6.101	5.452	5.951	5.302	23.350	23.887
February	5.569	5.518	5.419	5.368	23.188	23.276
March	5.637	5.563	5.487	5.413	23.031	23.016
April	5.439	5.399	5.289	5.249	22.469	23.743
May	5.191	5.348	5.041	5.198	22.100	24.375
June	5.128	5.520	4.978	5.370	22.094	24.612
July	5.152	.....	5.002	.....	22.406	.....
August	5.279	.....	5.129	.....	22.800	.....
September	5.514	.....	5.364	.....	23.165	.....
October	5.628	.....	5.478	.....	23.900	.....
November	5.976	.....	5.826	.....	24.083	.....
December	5.624	.....	5.474	.....	24.019	.....
Year	5.520	.....	5.370	.....	23.050	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG.

	Bessemer		Basic		No. 2 Foundry	
	1910	1911	1910	1911	1910	1911
January	$19 90	$15 90	$17 98	$14 40	$17 94	$14 75
February	18 96	15 90	17 21	14 50	17 38	14 81
March	18 53	15 90	16 93	14 65	17 00	14 96
April	18 28	15 90	16 84	14 65	16 75	15 00
May	17 10	15 90	15 94	14 30	16 18	14 72
June	16 52	15 90	15 60	14 06	15 53	14 56
July	16 40	.....	15 40	.....	15 40	.....
August	16 09	.....	14 89	.....	15 16	.....
September	15 92	.....	14 73	.....	14 93	.....
October	15 90	.....	14 05	.....	14 88	.....
November	15 84	.....	14 26	.....	14 78	.....
December	15 90	.....	14 15	.....	14 65	.....
Year	$17 10	.....	$15 65	.....	$15 83	.....

STOCK QUOTATIONS

COLO. SPRINGS July 3

Name of Comp.	Bid.
Acacia	.03
Cripple Cr'k Con.	.01½
C. K. & N.	.10
Doctor Jack Pot.	.06
Elkton Con	.59
El Paso	.50½
Findlay	.04
Gold Dollar	.10½
Gold Sovereign	.02⅔
Isabella	.10½
Jack Pot	.05
Jennie Sample	‡.09
Lexington	.01
Moon Anchor	.02
Old Gold	.02
Mary McKinney	.35
Pharmacist	.01
Portland	1.00
Vindicator	.78
Work	.01

SALT LAKE July 3

Name of Comp.	Bid.
Beck Tunnel	.26½
Black Jack	.13½
Carisa	.15
Cedar Talisman	.06
Colorado Mining	.48
Columbus Con	.42½
Daly Judge	‡4.30
Grand Central	.77
Iron Blossom	1.37½
Little Bell	.45
Lower Mammoth	.11
Mason Valley	9.00
May Day	.12
Nevada Hills	3.30
New York	‡.13½
Prince Con	.74
Silver King Coal'n	1.50
Sioux Con	.29
Uncle Sam	.59
Yankee	‡.20

TORONTO July 4

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	6.85	Pearl Lake	.61½
Hudson Bay	.80	Porcu. Gold	.63
Temiskaming	.48½	Porcu. Tisdale	.09½
Wettlaufer-Lor	1.18	Preston E. D.	.40½
Apex	.14	West Dome	1.90
Central	.83	Standard	.05
Dobie	2.55	Canada	1.10
Dome Exten	.84	Rea	5.46
Hollinger	13.92	Coronation	.34
Imperial	.16½	Swastika	.58

SAN FRANCISCO June 30

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.05	Belmont	6.12
Belcher	.53	Jim Butler	.26
Best & Belcher	.44	MacNamara	.18
Caledonia	.55	Midway	.18
Challenge Con	.24	Mont.-Tonopah	.70
Chollar	.11	North Star	.14
Confidence	.70	West End Con	.48
Con. Virginia	1.32	Atlanta	.12
Crown Point	.50	Booth	.07
Gould & Curry	.20	C.O.D. Con	.06
Hale & Norcross	.23	Comb. Frac	.08
Mexican	4.40	Jumbo Extension	.29
Occidental	.65	Oro	.05
Ophir	2.10	Silver Pick	.05
Overman	.48	St. Ives	.10
Potosi	.24	Tramps Con	.02
Savage	.22	Argonaut	2.00
Sierra Nevada	.45	Bunker Hill	‡7.00
Union Con	1.60	Cent. Eureka	1.00
Yellow Jacket	.40	So. Eureka	‡7.00

N. Y. EXCH. July 3

Name of Comp.	Clg.
Amalgamated	68
Am. Agri. Chem.	56⅛
Am.Sm.&Ref.,com	79¼
Am. Sm.& Ref., pf.	106⅛
Anaconda	40¾
Batopilas Min	1¾
BethlehemSteel pf	62
Chino	23
Comstock Tunnel	.27
Federal M.& S., pf.	64½
Goldfield Con	5½
Great Nor., ore ctf.	60½
Homestake	83½
Miami Copper	21⅞
Nat'nalLead,com.	55½
National Lead, pf.	106½
Nev. Consol	19½
Pittsburg Coal, pf.	84½
Ray Con	17¾
Republic I&S,com.	30
Republic I & S, pf.	93½
SlossSheffi'd,com.	49⅞
Sloss Sheffield, pf.	‡112
Tennessee Copper	40⅞
Utah Copper	49⅛
U. S. Steel, com	78⅛
U. S. Steel, pf.	118
Va. Car. Chem	55¼

N. Y. CURB July 3

Name of Comp.	Clg.
Barnes King	‡ 15
Braden Copper	4¾
B. C. Copper	5⅛
Buffalo Mines	1.60
Butte & Vipond	.55
Butte Coalition	19
Calumet & Mont.	‡.20
Cobalt Central	.02
Con. Ariz. Sm.	1⅜
Davis-Daly	¾
Ely Con	‡1½
Florence	1⅜
Giroux	5¼
Greene Cananea	7⅜
Greenwater	.07
Guanajuato	‡3¼
Guerrero	‡1⅛
Guggen. Exp	195
Inspiration	8¾
Internat. S. & R.	‡124
Kerr Lake	5⅛
La Rose	4¼
McKinley-Dar-Sa.	1⅜
Min. Co. of A. new	5½
Moneta Porc	16
Mont. Shoshone	‡ 04
Nev. Utah M. & S.	¾
New Baltic	6
Nipissing Mines	10
Ohio Copper	1 1/16
Pacific Sm. & M.	7/32
Precious Metals	‡1/32
Ray Central	1 1/16
Red Warrior	‡1⅛
South Utah M. & S.	7/8
Standard Oil	643
Stewart	.97
Tonopah	5¾
Tonopah Ex	.98
Tri-Bullion	3/4
Tularosa	1/4
Union Mines	‡7/16
Yukon Gold	4⅛

LONDON July 5

Name of Com.	Clg.
Camp Bird	£1 9s 9d
Dolores	1 3 6
El Oro	1 10 0
Esperanza	1 10 0
Mexico Mines	7 10 0
Oroville	0 6 6
Stratton'sInd.	0 2 3
Tomboy	0 19 0

BOSTON EXCH. July 3

Name of Comp.	Clg.
Adventure	6
Algomah	9⅛
Allouez	31
Am. Zinc	27¾
Arcadian	3½
Arizona Com	16
Atlantic	6
Bonanza	50
Boston & Corbin	14
Butte & Balak	4¾
Calumet & Ariz	57
Calumet & Hecla	470
Centennial	12
Con. Mercur	04
Copper Range	61
Daly-West	5½
East Butte	13⅜
Franklin	11⅞
Granby	39
Hancock	27½
Hedley Gold	15
Helvetia	1¼
Indiana	14
Isle Royale	17½
Keweenaw	3
Lake	36¾
La Salle	3½
Mass	8¼
Michigan	2
Mohawk	49
New Arcadian	3½
North Butte	32½
North Lake	8
Ojibway	7
Old Dominion	47½
Osceola	103
Parrot	12
Quincy	73
Shannon	11
Shattuck-Ariz	17
Superior	32
Superior & Bost.	6¾
Superior & Pitts.	16
Tamarack	34½
Trinity	4¾
U. S. Smelting	37¾
U. S. Smelt'g, pf.	48
Utah Apex	3⅛
Utah Con	17
Victoria	2
Winona	8
Wolverine	112
Wyandot	1⅝

BOSTON CURB July 3

Name of Comp.	Last
Ahmeek	165
Bingham Mines	‡1⅛
Boston Ely	1¾
Boswycocolo	.08
Cactus	.12
Calaveras	1 1/16
United Verde Ext.	.91
Chief Cons	1
Corbin	3⅞
Cortez	1½
Crown Reserve	3.20
First Nat. Cop.	1⅛
Live Oak	19½
Majestic	.75
Mazatan	‡1⅛
Nat'l Mine & Ex.	.18
Nevada-Douglas.	2½
Oneco	1⅛
Raven Copper	.29
Rhode Island Coal	2
San Antonio	‡1.03
South Lake	8
Trethewey	.90
Tuolumne Copper	‡4¾
United Zinc, pfd.	‡2
Vulture	6
Yuma	‡ 02

‡Last quotation.

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES

ABRASIVES—		
Carbons,good drill quality,carat		$50.00@75.00
Carborundum, f.o.b. Niagara Falls, powd.	lb.	.08
Grains	"	.10@.17
Corundum	"	.07@.10
Crushed Steel, f.o.b. Pittsburg	"	.05½@.06
Emery, in kegs; Turkish flour	"	.01¾@.02
Grains	"	.03½@.04
Naxos flour	"	.01¾@.02
Grains	"	.03½@.04
Chester flour	"	.01½@.02
Grains	"	.03½@.04
Peekskill flour, f.o.b. Easton, Pa	"	.01¼@.01¾
Grains, in kegs	"	.02¾@.03
Garnet, per quality	sh. ton	25.00@35.00
Pumice Stone,Am.Powd.,100 lb.		1.60@2.00
Italian, powdered	per lb.	.01¾@.01¾
Lump, per quality	"	.03@.30
Rottenstone, ground	"	.02@.04
Lump, per quality	"	.05@.20
Rouge, per quality	"	.05@.30
Steel Emery, f.o.b. Pittsburg	"	.07@.07½
ACIDS—		
Acetic 28%	lb.	.0169@.0184
Boric	"	.07
Hydrofluoric, 30%	"	.02¾@.03¼
" 48%	"	.06
" 52%	"	.06½
" 60%	"	.10
Hydrochloric acid, 20° per 100 lb.		1.25@1.50
Nitric acid, 36° to 40°	per lb.	.03⅞@.04½
Sulphuric acid,50°,bulk per ton.		$12 up
60°, 100 lb. in carboys.		.85@1.12½
60°, bulk, ton		16.00@18.00
66°, 100 lb. in carboys.		1.00@1.10
66°, bulk, ton		18.00
Oxalic	per lb.	.07½@ 072
ALCOHOL—Grain 95%	gal.	2.52@2.56
Denatured	"	.42
Refined wood, 95@97%	"	.52@.57
ALUM—Lump	100 lb.	$1.75
Ground	"	1.85
Chrome Alum	"	.04½@.05
ALUMINUM—Sulphate,com'l.	lb.	.90@1.50
AMMONIA—24 deg	"	.04½@.05½
" 26 deg	"	.04¾@.05¾
AMMONIUM—		
Bromide	lb.	.32
Carbonate	"	.08@.08⅜
Muriate grain	"	.05½@.06
Lump	"	.09½@.09¾
Sulphate, 100 lb.	"	3.10@3.15
Sulpho-cyanide com	"	.25
" " chem. pure	"	.35
ANTIMONY—needle,powder	lb.	.04½@.04¾
Oxide	"	.08¾@.10
ARSENIC—white	"	.01½@.01⅝
Red, Outside brands	"	.05½@.06½
Saxony	"	.06¼@.06¾
ASPHALTUM—		
Barbadoes	per ton	100.00@170.00
West Indies	"	30.00@60.00
Egyptian	lb.	.30@.40
Gilsonite,Utah ordinary	per ton	36.00@50.00
Trinidad	"	25.00@30.00
California	per ton	22.50@30.00
BARIUM—		
Carb. Lump, 80@90%	lg. ton	26.00@35.00
Precipitated, 96@98%	"	31.00@33.00
Powdered, natural	lb.	.02@.02½
Chloride com'l	ton	38.00@42.50
Nitrate powdered, in casks	lb.	.05½@.06½
Blanc Fixe, dry, bbl.	per lb.	.02¾@.04
BARYTES—		
Am. Ground	sh. ton	12.00@13.00
Floated	"	16.00@17.00
Foreign floated	"	18.50@22.50
BLEACHING POWDER—35% 100 lb		1.17½@1.40
BLUE VITRIOL—(copper sulphate), carload, per 100 lb.		4.50@4.75
BONE ASH	lb.	.02¾@.04
BORAX, sacks	"	.03½@.04
CALCIUM—Acetate,gray,100 lb.		1.87½@1.95
Carbide, ton lots f.o.b. Niagara Falls, N. Y.	sh. ton	65.00
Chloride, f.o.b. N. Y.	"	11.00@14.10
CEMENT—Slag cement	bbl.	0.75@1.25
Portland, Am. 400 lb	"	1.20@1.30
Foreign	"	2.25@2.90
"Rosendale," 300 lb.	"	.85
(in sacks)	"	.65
CHROME ORE—		
New Caledonia 50% ex. ship N. Y.	per lg. ton	14.00@16.00
Bricks, f.o.b. Fittsburg, per M.		175.00
CLAY, CHINA—Am. common ex-dock, N. Y.	ton	8.00@9.00
Foreign	"	11.50@18.00
COBALT—Oxide	lb.	.80@.85
COPPERAS—Bulk	100 lb.	$0.55
In bbls	"	.65@.85
In bags	"	.60@.80
CRYOLITE (carload)	lb.	.06½@.07
FELDSPAR—Ground	sh. ton	8.00@12.00
FIRE BRICK—		
American	per M.	30.00@40.00
Imported	"	30.00@45.00
St. Louis	"	16.00
Extra	"	20.00@23.00
Special extra	"	30.00@35900
FIRE CLAY—f.o.b. St. Louis.		
St. Louis, extra quality	per ton	5.00
" ordinary	"	2.50
FLUORSPAR—		
Domestic f.o.b. Pittsburg: Lump	ton	8.00@10.00
Ground	"	12.00@14.00
Foreign crude ex. dock	"	8.50
FULLER'S EARTH—Lump,100lb.		.80@.85
Powdered	"	.80@.85
GRAPHITE—Ceylon.		
Flying dust, finest to best	lb.	.01@.02
Dust	"	.02@.04
Chip	"	.03@.06
Lump	"	.04@.09
Large lump	"	.04@.08
GYPSUM—		
Fertilizer	sh. ton	5.00
Ground	"	4.00@7.00
INFUSORIAL EARTH—		
Ground Am. Best	lb.	.01¾@.02½
German	"	.02½@.02⅝
LEAD—		
Acetate (sugar of) brown	lb.	.07¾@.09½
Nitrate, com'l	"	.07⅞@.08⅛
MAGNESITE—Greece.		
Crude (95%)	lg. ton	7.50@8.50
Calcined, powdered	sh. ton	26.00@35.00
Brick, domes, per qual. f.o.b. Pittsburg	M.	160@200
MAGNESIUM—		
Chloride, com'l	100 lb.	.90@1.25
Sulphate (Epsom salt)	100 lb.	.90@1.00
MANGANESE—		
Foreign, crude, powdered: 70@75% binoxide	lb.	.006@.01
75@85% binoxide	"	.011@.015
85@90% binoxide	"	.01½@.04
90@95% binoxide	"	.06½@.08½
Ore, 80%-85%	sh. ton	12.00@25.00
MARBLE—Flour	sh. ton	9.00@9.50
MINERAL WOOL—		
Slag, ordinary	sh. ton	19.00
Selected	"	25.00
Rock, ordinary	"	32.00
MONAZITE SAND—		
Guar. 97%, with 5% Thorium oxide, normal	lb.	.08 and up
NICKEL—		
Oxide, crude, lb. (77%) for fine metal contained		.40@.45
Sulphate, single	lb.	.10½@.11
Sulphate, double	"	.05⅞@.08
NITRATE OF SODA—		
100 lb. 95% (spot)		2.12½
95% (future)		2.15
96% is 2½@7½c. higher per 100 lb.		
OZOKERITE—best	lb.	.12@.16
PAINTS AND COLORS—		
Litharge, Am. powdered	lb.	.07½@.07¾
English glassmakers'	"	.08¾@.09½
Lithophone	"	.03¾@.04
Metallic, brown	sh. ton	18.00@20.00
Red	"	25.00@30.00
Ocher, Am. common	"	20.00@25.00
Best	"	22.00@30.00
Dutch, washed	lb.	.05@.05½
French, washed	"	.01¾@.02½
Paris green, pure, bulk	"	.13@.18½
Red lead, American	"	.06½@.07½
Foreign	"	.08½@.09
Turpentine, spirits bbl., per gal.		.57@.65
White lead, Am., dry	lb.	.05½@.06
American, in oil	"	.07½@.07¾
Foreign, in oil	"	.09¼@.09⅞
Zinc white, Am. extra dry	"	.05¾@.06½
French proc's, red seal, dry	"	.08¼@.08½
French process, green seal, dry	"	.10¼@.10½
PHOSPHATES—Acid		60@62c. per unit
*Fla., hard rock 77%		5.75@6.25
land pebble 68%		3.75@4.00
†Tenn., 78@80%		5.00@5.50
75%		4.75@5.00
68@72%		4.25@4.50
‡So. Car. land rock 60%		3.50@3.75

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

POTASSIUM—		
Bicarbonate crystal	lb.	$.07½@.08
Powdered or granulated	"	.08@.08½
Bichromate, Am.	"	.07⅜@.07¾
Scotch	"	.10½
Bromide	"	.20
Carbonate (80@85%)	"	.03½@.04
Caustic, ordinary	"	.03¾@.05¾
Elect. (90% KOH)	"	.05⅛@.05½
Chloride (muriate), 100 lb.		1.90
Chlorate, powdered	"	.08¼@.09½
Crystals	"	.08¼@.09¼
Cyanide (98@99%)		
Carloads (30,000 lb.)	"	18c.
5-ton lots		18½c.
Less than 5 tons		.19
Kainite, long ton, bulk, 7.50; bags,		8.50
Permanganate	lb.	.09½@.10½
Prussiate, yellow	"	.13@.13¾
Red	"	.26@.30
Sulphate (basis 90%)	100 lb.	2.18@2.21
PYRITE—		
Domestic, non-arsenical, furnace size,f.o.b. R. R. per unit		.12@.12½
Domestic, non-arsenical, fines, per unit, f.o.b. mines		.09½@.11½
Imported, non-arsenical, furnace size, ex-ship, per unit		.13@.13¼
Imported, arsenical, furnace size, ex-ship, per unit		.12½@.12¾
Imported fines,arsenical,ex-ship		.09½@.10
Imported fines, non-arsenical, ex-ship, per unit		.10½@.11

Pyrite prices are per unit of sulphur. A deduction of 25c. per ton is made when ore is delivered in large lumps.

SALT—N. Y. com. fine 280 lb. bbl.		.72@1.13
N. Y. agricultural	sh. ton	3.80@4.50
SALTPETER—Crude	100 lb.	4.00@4.50
Refined, crystals		5.00@5.75
SILICA—		
Ground quartz, ord'ry	lg. ton	7.00@15.00
Silex, ground	"	7.00@15.00
Silex, floated	"	30.00@40.00
Lump quartz	"	5.00@5.50
Glass sand	"	2.75
SILVER—Nitrate, crystals	oz.	.33½@.36¾
SODIUM—Acetate	lb.	.04½@.05
"Alkali," per 100 lb., 58|48		.90@.95
Bicarb. soda, per 100 lb		1.00@1.30
Soda, caustic, per 100 lb., 78|60		1.70@1.80
Soda, caustic, powdered		.02½@.03
Salt cake, per 100 lb., bulk		.50@.62½
Salt Cake, bbl.		.67½@.80
Soda, monohydrate, per lb.		1.30@1.75
Bichromate	lb.	.05¾@.05¾
Bromide	"	.20
Chlorate, com'l	"	.08¼@.09½
Cyanide, 120-130% KCN, per 100%		
Carloads (30.000 lb.)	lb.	18c.
5-ton lots	"	18½c.
Less than 5 tons	"	.20
Hyposulphite, Am.	"	1.30@1.50
Phosphate	100 lb.	2.10@2.40
Prussiate	"	.08@.08¾
Sal soda, f.o.b. N. Y.	"	.60@.75
Foreign, f.o.b. N. Y.	"	.80@1.00
Silicate, com'l	"	.65@1.00
Sulphate, com'l (Glauber's salt)	100 lb.	.60@.80
Sulphate, com'l, calcined		.65@.85
STRONTIUM—Nitrate	lb.	.07@.08
SULPHUR—Louisiana (prime) to New York	lg. ton	22.00 up
To Boston, Philadelphia or Baltimore	"	22.50 up
Roll	100 lb.	1.85@2.15
Flour	100 lb.	2.00@2.40
Flowers, sublimed	100 lb.	2.20@2.60
Powdered commercial, bags		1.55
Sicilian, extra qual., unmixed seconds, crude brimstone to New York	lg. ton	$22.00
TERRA ALBA—Fr.&Eng.	100 lb.	.75@.80
TALC—Domestic	sh. ton	12.00@25.00
French	"	15.00@25.00
Austrian	"	33.00
Italian, best	"	35.00
TIN—Bi-chloride, 50°	lb.	.13
Crystals	"	.28½
Oxide, lb.	"	.45
URANIUM—Oxide	"	2.20@4.25
ZINC—Chloride sol., com. 20	lb.	.02¼
Chloride, granular	"	.04@.04½
Dust	"	.06¾@.07
Sulphate	"	.02@.02½

NOTE.—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites and sulphur, in which there are well established markets, the quotations are substantially representative. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in selling their output on private contract.